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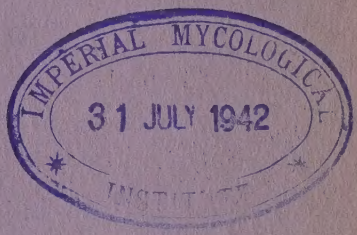

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NOTE:—In certain cases it is not possible to check references in the original publication. Such references are marked with an asterisk.

Bulletins on disease subjects written for farmers and "popular" articles of a similar nature are not included in the *Veterinary Bulletin*. Those of a sufficiently important nature, are, however, included in *Index Veterinarius*; so also are certain review articles, presidential addresses, congress proceedings, etc., where the title conveys as much information as could be given in an abstract of a few lines. For information of this nature, readers of the *Veterinary Bulletin* are referred to *Index Veterinarius*, where titles of all publications indexed by the bureau are fully cross-referenced.

A list of annotations and reviews, classified according to subject, is now given in *Index Veterinarius*, being inserted at the end of each number. Such papers will not necessarily be dealt with in the *Veterinary Bulletin*.

The Editor will be glad to receive publications relating to Veterinary Science and cognate subjects in order that they may be dealt with in the *Veterinary Bulletin*.

Reports of Departments, Special Reports, reprints, etc., etc., should be sent as soon as they are issued.

Books for Review.

The Editor will be glad to receive books for review in the *Veterinary Bulletin*.

In order to economise in the use of paper, the *Veterinary Bulletin* is now printed in smaller type and with deeper and wider columns. There is no reduction in the number of abstracts.

Review on "Antibacterial Agents derived from Micro-Organisms"

Reprints of this review may be obtained from: Central Sales Branch (Imperial Agricultural Bureaux), Agricultural Research Building, Penglais, Aberystwyth. Price 1/- each.

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THE

VETERINARY BULLETIN

REVIEW ARTICLE

THE PRESENT POSITION OF PHENOTHIAZINE AS AN ANTHELMINTIC

BY

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Phenothiazine or thiodiphenylamine has been known to organic chemistry in general, and to the dye industry in particular, since 1885 when Bernthsen first synthesized it and investigated its chemistry. It was not, however, until Campbell *et al.* (1934) reported its lethal effect on the larvae of culicine mosquitoes that any biological use was found for it. Further studies of its insecticidal action were then made, in particular as to the possibility of its replacing lead arsenate as a stomach poison, but a great departure was taken in the route followed by the investigations when Harwood, Jerstad and Swanson (1938) discovered that the drug was an anthelmintic for ascarids and nodular worms in swine. Subsequently it was tried in various animals including man, and enthusiastic reports of its outstanding anthelmintic qualities have appeared from the U.S.A., many of the Dominions, and Britain.

The early reports clearly demonstrated that phenothiazine possessed the two fundamental qualities of an anthelmintic, a lethal action on worms and a low toxicity for the host, but the acclamation given to the drug tended to be overdone. At first it was described as virtually non-toxic but later, as its use was extended, cases of phenothiazine poisoning were reported. The pendulum then swung the other way, and it was suggested that the drug was, perhaps, treacherous and warnings appeared that it was unsafe to use it in some hosts.

This paper reviews the results to date, so that the advantages and disadvantages of the drug may be seen in proper perspective; the review too, will serve to emphasize the need for more work, particularly in relation to its pharmacology.

The forms in which phenothiazine is given to animals, and the methods of evaluating the results are discussed first. The former have an unusual significance because of the very bulky dose which is often required, *e.g.* 30 g. or more for cattle and sheep.

ADMINISTRATION OF PHENOTHIAZINE

Phenothiazine, when pure, is a pale lemon-coloured powder which has a very low solubility in water—estimated at 1 : 800,000 in the I.C.I. laboratories—and a pronounced "unwettability". It thus cannot be given in measurable amount in aqueous solution, nor can it be suspended in water without adding wetting or dispersing agents. The pure substance (the "unconditioned powder") has, therefore, been given to animals either in gelatin capsules or mixed with the food. Most animals will take it in the food, but group feeding of phenothiazine might be a dangerous procedure, some animals obtaining considerably more than their share of the dose.

If tablets are made, a binding agent must be mixed with the drug, but it must be one that allows the tablet to break up easily in the alimentary canal; preferably a dispersing agent should also be incorporated. An example of such a tablet is that of Swales (1940*c*). Its composition is :- commercial phenothiazine (95% pure) 80 parts; starch 8 parts; sodium bicarbonate 5 parts; tartaric acid 4 parts; sodium choleate 2 parts; phenolphthalein 1 part. Swales believes that phenothiazine has a constipating action and the phenolphthalein is incorporated to counterbalance it. He suggests, also, that the laxative effect of this substance will decrease the amount of phenothiazine absorbed.

Finally, the drug can be used in the form of a specially prepared, relatively stable suspension containing about 40% (weight/volume) of phenothiazine.

Results indicate that there is nothing to favour one or other of these ways of administration (provided the unconditioned drug is finely powdered) and the choice is really that of convenience. Feeding phenothiazine with food has the disadvantage already mentioned, although it might be suitable for the treatment of horses and human beings fed individually or of animals in which preventive medication is practised. Capsules are inconvenient because of the bulky dose, and it is better to replace them with tablets. The liquid suspension is easy to give, but if any is spilled it will later be converted to the red oxidation products of phenothiazine, *viz*, thionol and phenothiazone, which are

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The Imperial Bureau of Agricultural Parasitology (Helminthology), St. Albans, is about to publish "Bibliography of Phenothiazine as an Anthelmintic". Price 2/- post free from Central Sales Branch, Aberystwyth.

extremely fast dyes. (Attempts to remove them from wool in the I.C.I. laboratories have been unsuccessful.) In the case of sheep, for example, this should obviously be avoided if possible, although the staining of the perianal fleece cannot be prevented.

In most worm infestations, if the drug is effective at all, one large dose will reduce considerably the numbers of nematodes present, and will eliminate some species completely. In human beings, however, the one large dose has not been tried, but in the traditional manner has been split up and spread over several days. There is no experimental basis for this procedure, and it might prove a method to be discouraged. We point out later that there is some correlation between toxicity and the administration of repeated small doses, which, although not complete, suggests that in human beings a trial should be made of one big dose.

Evaluation of Results

The common method of assessing a helminthic infestation in an animal, and plotting its rise or fall with time, is by means of egg counts. Too many variables are involved for it to be strictly quantitative, *e.g.* the degree of wetness of the faeces, the amount of roughage in the faeces, the peculiar physiology of the individual and so on, but if it is used intelligently and significance is not given to small variations, it does yield useful preliminary results. It will not, however, give critical results unless it is supplemented by other examinations, which may be one of two kinds.

(1) During the 3–4 days following anthelmintic medication, all the worms passed are classified and counted. The animals are then killed and another detailed count is made of the living worms remaining in the alimentary canal. A balance sheet can now be drawn up for the anthelmintic treatment to show what has been accomplished. This method is customarily referred to as the critical method of evaluating anthelmintic efficiency. It should be noted, however, that it is possible that worms living high up in the alimentary canal are digested as they pass through the intestine, and the figure for anthelmintic efficiency arrived at by this method may be too low for them.

(2) The experimental animals are divided into two groups, one of which is treated while the other serves as a control. The animals of both groups are then killed and their respective worm counts compared. If care is taken in the first place to chose animals with *reasonably comparable infestations* this method, too, will yield good results.

In human beings it is usual to aim at complete elimination of the worms; results are correspondingly easy to judge.

The evaluation of results has been discussed because the points emphasized serve to explain why all the papers on phenothiazine as an anthelmintic are not mentioned in this review. We believe that it can be assumed now that phenothiazine is an anthelmintic; it is its qualities in this respect which concern us here. Critical results must, therefore, be sought.

Specific Anthelmintic Action of Phenothiazine

(1) *In Sheep.*—It is generally agreed that the dose employed must be about 0·3–0·5 g. per lb. body weight (about 15–35 g. per animal). Doses below this level will probably have some action on *Haemonchus* and may exert an action against some other species, but their effect on the whole is uncertain. Whitlock and Cox (1940) have suggested that, before dosing with phenothiazine, stimulation of the nasopharynx with 2·5 ml. of 10% copper sulphate to encourage closure of the oesophageal groove is beneficial. Little work, however, seems to have been done on this point.

The results which have been obtained may be summarized as follows.

(a) Most workers affirm that phenothiazine is virtually 100% efficient in removing *Haemonchus contortus*. It is less efficient, but still very good, in removing *Trichostrongylus axei*, *Ostertagia circumcincta*, and *O. trifurcata*. All these species, it will be noted, are from the abomasum. It will remove the immature stages of *H. contortus*, which is important because it is then unnecessary to repeat treatment at short intervals (Gordon, 1940*b*).

(b) It is extremely effective in eliminating the nodular worm *Oesophagostomum* from the colon.

(c) Robertson (1941) mentions that two ewes with advanced chabertiosis made a remarkable recovery following phenothiazine treatment. Good results against *Chabertia* are also recorded by Swales (1940*c*) and by Peters and Leiper (1941). In doses above 20 g. per animal a good effect against *Bunostomum* is to be expected (Habermann and Harwood, 1940; Swales, 1940*c*).

(d) It appears to be less effective against the intestinal worms *Trichostrongylus* sp., *Cooperia* sp., and *Nematodirus* sp. The figures given by Swales (1940*c*) and Taylor and Sanderson (1940) indicate an efficiency for these worms of 50–90%; but in other instances (*e.g.* Singer and Baker, 1940; Stewart and Crofton, 1941) the results recorded are not so good.

(e) Peters and Leiper (1941) are the only workers to record any effect against *Strongyloides*. No one has obtained positive results with *Trichuris* and the tapeworm *Moniezia*.

(f) Where comparative trials have been made between phenothiazine and the standard copper sulphate + nicotine sulphate mixture (McEwen, 1940; Singer and Baker, 1940; Boddie *et al.*, 1941; Stewart and Crofton, 1941; Shorb, Habermann and Heemstra, 1941), or tetrachlorethylene (Singer and Baker, 1940), the superiority of phenothiazine has been attested.

Such are the findings of most workers, but three papers have appeared which decry the anthelmintic properties of phenothiazine against sheep nematodes, *viz*, Shaw (1941), Peters, Leiper and Clapham (1941), and Leiper, Peters and Clapham (1941). Shaw's experiments are difficult to interpret; but we get the impression that his animals did not die from uncomplicated helminthiasis. The results obtained by Peters *et al.* were negative, but it is not possible to discuss them without giving more space to them than can be allowed here. It must suffice to say that in later work (Peters and Leiper, 1941) positive results were achieved, and that the higher dose used in this work (40 g. per animal as contrasted with 0·3 g. and 1 g. per lb. body weight in the earlier experiments) is not sufficient to account for the difference in results.

It is still undecided how phenothiazine should be used as a prophylactic measure against nematodes in sheep. As a curative measure for parasitic gastro-enteritis repeated doses might be necessary, but Swales (1940*b*) deprecates this procedure for prophylaxis in Canada. Instead, he advocates a single, large (30–40 g.) springtime dose. Canadian conditions—the severity of the winter and the consequent elimination of larvae on the pastures—cannot, however, be compared with those in the United Kingdom, and further experiments are necessary to determine the routine suitable for countries with a temperate climate.

(2) *In Cattle.*—Fewer experiments have been done than with sheep, but comparable results have been

obtained. The action of the drug is again confined mostly to that against the nematodes of the abomasum and the colon. Thus Porter (1941) records a full effectiveness of the drug against *Haemonchus*, *Trichostrongylus axei*, and *Oesophagostomum* and a less marked action against *Ostertagia*, but virtually no action against other species. The work confirms that of Swanson, Porter and Connelly (1940), Taylor and Sanderson (1940), Swanson and Carlisle (1941), Porter, Simms and Cauthen (1941), and Roberts (1941). The last worker also records an effect against *Cooperia*.

The dose employed has varied between 0·16 and 0·8 g. per lb. body weight, but the indications are that 0·2 g. per lb. body weight is quite satisfactory. There is some evidence that cattle are not as tolerant as sheep to phenothiazine and the dose should, therefore, be kept as low as possible, particularly in the treatment of calves.

(3) *In Goats.*—The only trials which appear to have been made yielded results practically identical with those from sheep (Taylor and Sanderson, 1940).

(4) *In Pigs.*—Critical experiments by Swanson, Harwood and Connelly (1940) on about 50 pigs confirm the earlier work of Harwood, Swanson and Jerstad (1938). Their results show that a dose of about 0·2 g. per lb. body weight is more than 90% efficient in removing *Oesophagostomum* and moderately efficient (50% or more) in removing mature ascarids. No effect was recorded against the stomach worms *Ascarops*, *Physocephalus*, and *Hyostrongylus*, or against the hookworm *Crassisoma*, the thornyheaded worm *Macracanthorhynchus*, and the whipworm *Trichuris*.

Roberts (1941) suggests a dose of 0·25 g. per lb. body weight for *Oesophagostomum*. Higher doses of the order of 0·8 g. per lb. body weight may cause toxic effects.

(5) *In Horses.*—Phenothiazine had every indication of being the best anthelmintic yet discovered against the strongyloid worms of the large intestine. Its excellent anthelmintic promise has been somewhat dimmed, however, by occasional instances of a toxic effect on the host. These instances are considered in the section on toxicity. For the rest, we may summarize the results as follows.

(a) Earlier workers (*e.g.* Howell and Britton, 1940; Grahame, Morgan and Sloane, 1940) set the dose too high, and it is best to follow the recommendations of Errington (1941) and Knowles and Blount (1941) and not allow it to exceed 30 g.

(b) The drug has a marked effect (almost 100%) against the cylicostomes and *Strongylus* spp. of the large intestine.

(c) Evidence is conflicting concerning its efficacy against the other nematodes. Howell and Britton (1940) affirm its effectiveness against the stomach worm *Trichostrongylus axei* and the pinworm *Oxyuris equi*, but found no action against *Ascaris equorum*. Taylor and Sanderson (1940), on the other hand, found that "*Ascaris* is, as a rule, satisfactorily expelled", but that "*Trichostrongylus axei* does not respond well". Finally, Habermann, Harwood and Hunt (1941) report a fair efficiency (72%) against *Ascaris*, but no action against *Oxyuris*.

(d) It has no action by itself against bots, but Boley *et al.* (1941) searching for a single treatment effective against both bots and nematodes tried a mixture of phenothiazine and carbon bisulphide. Forty-four horses were each given 40 g. phenothiazine and 24 ml. carbon bisulphide following a 36-hour fast. The mixture exhibited "a high degree of efficiency against ascarids and strongyles, as judged by egg counts, and many bots were also passed after treatment".

(6) *In Dogs.*—The trials which have been given to the drug in dogs have yielded negative results. Montgomerie (1940) found it of no use as a canine ascaricide, and Kauzal and Whitten (1941) concluded that it was of no value against ascarids, hookworms, *Trichuris*, or the tapeworm *Dipylidium*.

(7) *In Poultry.*—Few papers have been published concerning its action in poultry. The doses used have varied between 0·05 g. and 0·5 g. The higher ones seem almost completely effective in eliminating *Heterakis*, but the action against *Ascaridia* is less marked. Roberts (1940) found the drug ineffective against the common tapeworms. McCulloch and Nicholson (1940) state that administering it in capsules is more successful than giving it in the food.

It is worth pointing out that the efficiency of phenothiazine against *Heterakis* might make it a valuable agent in the control of so-called "blackhead disease" in turkeys, a disease which is transmitted from bird to bird in great measure by the eggs of *Heterakis*.

(8) *In Man.*—Manson-Bahr (1940) was the first to try phenothiazine as an anthelmintic in human beings. He used it in three patients with *Ancylostoma duodenale*, in nine patients with *Ascaris lumbricoides*, and in nine patients with *Enterobius vermicularis*. His results against the hookworm were entirely negative, even with a dose as high as 30–40 g. Against *Ascaris* some degree of positive action was obtained; two patients, given 8 g. daily for three days followed by a dose of Glauber's salt, were completely freed of the worms, but from seven others, given doses of 16–48 g., only one round worm was recovered. Against *Enterobius* the results were very good, all the patients being cured. The doses advised against this worm were :– 2 g. per day for seven days to children under eight years of age, half this dose for children under four, and 8 g. per day for five days to adults. We now know that these doses are too high to be generally recommended.

Kuitunen-Ekbaum (1941) gave phenothiazine to 89 children and nine adults for the treatment of enterobiasis. The doses were 4–5 g. for children 2–5 years old, 6 g. for those 6–8 years old, and 8 g. for those nine years and over. A dose was apparently spread over 4–6 consecutive days, so that each child received 1 g. or less of the drug per day. It will be noticed that the dose for the first age group is about the same as that recommended by Manson-Bahr, but that for the second age group is, at the most, half of the Manson-Bahr dose, and that for the third group is only a fifth of it. The drug was administered to children in the food (in porridge or cereals) and to adults either in water or in capsules. No laxative was given. Of the 89 children and nine adults treated, 76 children and eight adults were cured by the first course of treatment; the remainder, except for one child, responded to a second course. No toxic effects of the treatment were observed.

Hubble (1941) also showed that phenothiazine, in a dose of 1 g. per 10 lb. body weight spread over 3–5 days, is an effective remedy against *Enterobius*, but it is a remedy which is "probably too dangerous . . . to be used in the routine treatment" of this worm. He makes this conclusion because, out of the 30 or so cases which he treated, three developed haemolytic anaemia. His warning seems to have been justified, for a case has been reported (1942. *Lancet*. **242**. 86.) in which a girl of six years died of acute haemolytic anaemia after taking phenothiazine. It had been advised to give the girl a ½ g. tablet four times a day; three tablets were taken on the first day, four on each of the next three days, and two on the fifth day—a total dosage of 8·5 g. She became ill on the fifth day with slight facial icterus and

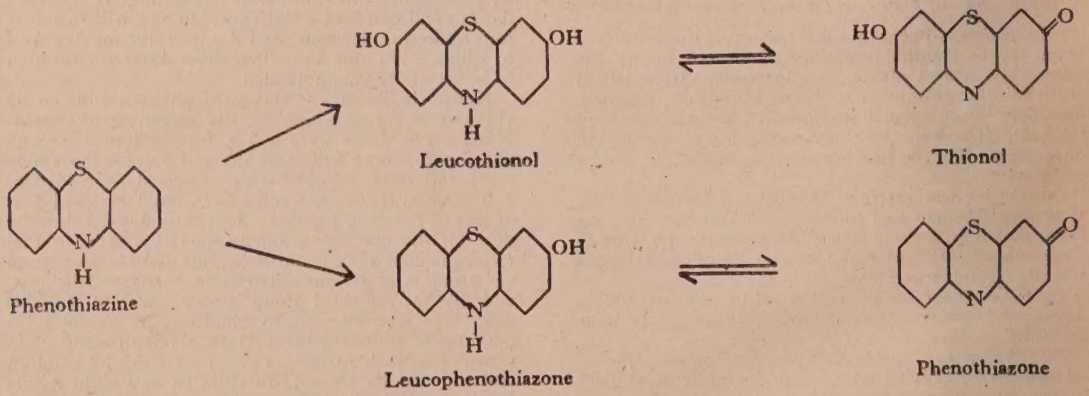
headache, and on the tenth day she was admitted to hospital with slight jaundice, a rapid pulse and a temperature of 101°F. A blood examination showed red cells 1,250,000, haemoglobin 26%, white cells 16,850, normoblasts 1%, reticulocytes 22·6%, platelets 236,000 per cu.mm. A drip transfusion of 10 oz. whole blood given the day after admission was followed by a rigor, a rise of temperature to 106·8°F. and a pulse rate of 160. She died about 12 hours after the transfusion.

Elliot (1942) has recorded an interesting and successful treatment of dracontiasis with phenothiazine. A warm olive oil suspension of the drug is injected intramuscularly as near the course of the worm as possible. Two or three sites are injected with ½–1 g. of phenothiazine, and treatment may be repeated at weekly intervals. No toxic effects have been encountered even when as much as 8 g. (2 g. at weekly intervals) has been given.

(9) *In Experimental Trichinosis.*—McNaught, Beard and DeEds (1939*a*) claimed that feeding phenothiazine to rats during the time when they were being infected with *Trichinella spiralis* considerably reduced the number of larvae encysting in the muscles. Later (1939*b*), however, they withdrew this claim.

Pharmacology of Phenothiazine and its Action on Nematoda

It is necessary, first, to emphasize certain aspects of the chemistry of phenothiazine, more particularly the ease with which it is oxidized. As long as it is kept dry it is relatively stable, but under moist conditions spontaneous oxidation begins. The route taken by the oxidation reactions depends upon the conditions; most frequently it leads to either thionol or phenothiazone, both of which are red dyes (see diagram).



The immediate precursor of thionol or phenothiazone is, in each case, a colourless leuco compound and, as indicated by the arrows between the formulae, the systems leuco compound—dye are reversible reactions. Whether it is the leuco compound or the dye which exists at any one time will depend on the oxidation-reduction potential of the system. If the oxygen pressure within the system is below a certain limit, or in the presence of reducing agents, the leuco form exists; above this limit, or in the presence of oxidizing agents, the dye is formed.

When an animal is dosed with phenothiazine one of the most obvious results is that the urine turns red on exposure to air. Clearly, then, a significant amount of absorption of phenothiazine or a derivative of it occurs, and it is excreted, in part at least, as the leuco form of one of its red dye derivatives. DeEds, Eddy and Thomas (1938) studied its excretion in rats, rabbits, and man after oral administration, and concluded that it was in the urine as two forms, first as a water-soluble conjugated derivative (phenothiazine plus an unknown), and second as the system leucothionol-thionol. The conjugated derivative could be broken down by acidification with strong hydrochloric acid in the cold, and the resulting precipitate purified by extraction with alcohol. The purified product had a melting point of 180°C. which is the melting point of phenothiazine. The leucothionol-thionol system was identifid by its potentiometric characteristics.

These results were amplified by Lipson (1940) who studied the excretion of phenothiazine in sheep. He, too, broke the conjugate by acidification with strong hydrochloric acid, and identified the precipitate as phenothiazine by its melting point. The filtrate was extracted with chloroform, and the constituents of the extract separated by selective adsorption on alumina. Thionol, identified by its absorption spectrum, was adsorbed, while phenothiazone, identified by its melting point, was not. He therefore concluded that "the colour developed in sheep's urine is due as much to phenothiazone as to thionol".

Collier's (1940*a*) work on sheep disagreed with that of both Lipson and DeEds. His analysis of the water-soluble conjugate led him to believe that it was formed from leucophenothiazone and a potassium salt which is probably potassium sulphate. A melting point determination on the hydrolysed conjugate does not appear to have been done. The same conjugate was found in the blood and in the milk, and a method was evolved for its estimation based on an earlier method of Eddy and DeEds (1937). The basis of both methods is oxidation to the coloured derivative which is then estimated colorimetrically.

Using Collier's quantitative methods, Swales and Collier (1940) studied further the fate of phenothiazine in sheep. Their estimations of phenothiazine and its derivatives in the faeces and in the urine accounted for about 80% of the total dose given, an amount which was divided more or less equally between the urine and the faeces. Phenothiazine began to appear in the faeces about eight hours after dosing (they do not believe that oxidation products of it are present in the fresh faeces), but it was demonstrable in the stomachs and intestines as long as four days later. The derivative which they regard as conjugated leucophenothiazone they found to be measurable in the bloodstream one to 72 hours after dosing, and in the urine from half-an-hour to 102 hours. The maximum concentration of it was present in the

blood and in the urine after about six hours. The close parallel between blood and urine concentrations suggested that excretion closely follows absorption.

The excretion of derivatives in the milk of lactating ewes enabled Swales and Collier to observe an interesting bacteriostatic effect of these compounds which is in harmony with the earlier suggestion that they act as urinary antiseptics by virtue of their excretion in the urine. It was noted that " milk turned to a pink colour after being exposed to air and light for several hours, and that it did not decompose when left standing in a warm room for several days ".

Lipson and Gordon (1940) working more or less synchronously with Swales and Collier obtained similar results for the passage of phenothiazine through the alimentary canal of sheep. In 12 experimental animals, an average of 32% of the dose was recovered from the faeces (in three of them more than 50% was recovered).

We have now to attempt to find the significance of these facts in relation to the anthelmintic activity of phenothiazine.

Phenothiazine has only a very low solublity in water, and yet a comparatively large dose is required for full anthelmintic action, and half of this dose appears in the faeces unchanged. Is this because a derivative of phenothiazine is the actual anthelmintic and only part of the dose becomes changed into this active form ? Collier (1940*b*) has advanced some evidence that it may be a derivative which is the active principle. He tried to determine precisely what phenothiazine does to living tissue and examined its effect on various enzyme systems ; it had no effect on mammalian catalase or on the cytochrome oxidase system. On the other hand, leucophenothiazone, leucothionol, and thionol strongly inhibited both systems. One of these substances, then, might be the anthelmintic. Now according to Collier and Swales a conjugate of leucophenothiazone is demonstrable in the urine within half-an-hour of dosing, indicating rapid alimentary absorption, but because phenothiazine is so insoluble it is suggested that before absorption, rapid oxidation and conjugation take place in the upper digestive tract. In other words, they suggest that leucophenothiazone (conjugated) is rapidly formed and absorbed in the alimentary canal, and quickly excreted. It is clearly possible, then, for its absorption to occur so quickly that it is removed from the sphere of action around the nematodes too soon for it to serve as the anthelmintic. In any event, Gordon and Lipson (1940) tried phenothiazone as an anthelmintic without effect.

DeEds and Thomas (1941) were also attracted by the idea that it is a derivative which acts as the anthelmintic. They showed that absorbed phenothiazine is excreted in part in the bile of man, rabbits, and dogs in the form of phenothiazine, leucothionol, and thionol. (Personal observations by D.G.D. have shown that phenothiazine and/or its derivatives are also excreted in the bile of sheep.) Believing that thionol might have anthelmintic properties they tried its action on *Ascaris* from the pig. Their experiments consisted of observing the influence on the worms of saturated solutions in saline of phenothiazine, thionol, and thionol plus bile salts, over a period of about three hours in each experiment. On the basis of the degree of activity of the worms, least in thionol with bile salts, little in thionol alone, and normal in phenothiazine, they advance the view that thionol is more toxic to worms than is phenothiazine. They believe that their evidence is " highly suggestive that the anthelmintic action of phenothiazine is due to the thionol excreted into the intestine by way of the biliary tract, and that bile facilitates this action ".

Apart from the notorious difficulty of interpreting hour-to-hour activity of *Ascaris*, DeEds and Thomas have not considered :— (a) that Gordon and Lipson (1940) tried thionol as an anthelmintic in sheep and found it ineffective against *Haemonchus contortus* and *Trichostrongylus* sp., and (b) that phenothiazine is most active against worms in the stomach, caecum, and colon. In the stomach it is not helped by bile salts and thionol is not obviously present ; by the time the caecum is reached bile salts are probably mostly absorbed. Incidentally, if thionol has anthelmintic properties, then because it is excreted in the bile, it might be expected to have some action on *Fasciola*, but no such action has been reported.

Considered from all aspects the evidence that a derivative is the anthelmintic principle is slight, and we believe that it is phenothiazine itself which is the essential substance, or at least that it is the substance taken into the nematodes. Once inside the nematode its toxic effect may be dependent on its oxidation, but we have no information on this point. In a paper to be published shortly by one of us (D.G.D.) it will be shown that most of the successful anthelmintics—carbon tetrachloride, hexylresorcinol, tetrachlorethylene, etc.—are capable of acting on nematodes through the cuticle, whereas phenothiazine is exceptional in that it will not penetrate the cuticle. We think that particles of phenothiazine are taken in through the mouth of a nematode and that this explains the big anthelmintic dose. Briefly, for the dose to be effective, a certain concentration of particles of phenothiazine has to be attained in the contents of the alimentary canal. If this view is correct it is clearly most important that the phenothiazine in the alimentary canal should be finely particulate. [Gordon (1940*b*) did find that finely ground phenothiazine was somewhat more efficient than phenothiazine fused into " coarse lumps ", although not markedly so. It should be noted, however, that the preparation " thiox " which he used contains a wetting agent, and it is possible that some of the coarse lumps became broken up into fine particles.] We cannot, however, advance any reason why phenothiazine should be particularly effective against the " stomach worms " of ruminants and worms from the caecum and colon (except *Trichuris*), and only partially effective against most intestinal worms. The reason may be linked with the rate of emptying of these various parts of the alimentary canal.

Toxicity of Phenothiazine

During the last year or so millions of sheep*, thousands of horses and cattle, numerous pigs, and more than 200 human beings (reported cases) have been treated with phenothiazine and, recalling the history of other chemotherapeutic agents, as the treatment has become extensive, so have instances of toxic effect come to be reported. Almost all the instances met with in routine treatment have been confined to horses, but in experimental treatments the toxicity of the drug to other animals including man has been demonstrated. The adverse effects are sometimes clearly the result of general overdosing, but sometimes they appear due to what might be " susceptibility " to the drug.

Toxic Effects in Pigs.—Lapage (1940) concluded that care should be used when giving phenothiazine to young pigs. In his experiments some three-month-old pigs exhibited toxic effects, particularly symptoms of ataxia, after one dose of 0·5 g. per lb. body weight. Roberts (1941) also found young pigs susceptible to phenothia-

* In Texas alone, during a period of about six months in 1941, between 2 and 2½ million sheep and goats have been treated (*J. Amer. vet. m-d. Ass.* **34**. 441).

zine poisoning when the dose was as high as 0·8 g. per lb. body weight; again ataxia was observed. Rietz (1942) observed the same effect in four-week-old pigs which had been given 5 g. each of phenothiazine, and a peculiar dermatitis, like advanced scabies, in eight-week-old pigs which had been given 6 g. each. It is possible that this dermatitis is a photosensitization effect comparable with that recorded in man, but the conditions under which the pigs were kept are not described in sufficient detail for us to more than guess this.

Toxic Effects in Cattle.—According to Taylor and Sanderson (1940) " cattle appear to be more sensitive (than horses or sheep) to the toxic action of phenothiazine, 85 g. having produced a fatal intoxication in a 105 lb. calf ". Roberts (1941) is of a similar opinion, for in his experiments each of eight animals, given doses varying from 0·16–0·8 g. per lb. body weight, showed some toxic effect. With the lower doses the ill effects were temporary inappetence and constipation; the higher doses were associated with severe abdominal pain and posterior incoordination. One calf, which received a dose of 70 g. (0·5 g. per lb. body weight) died.

Toxic Effects in Sheep.—Taylor and Sanderson (1940) tried the effect of giving phenothiazine daily in the food to sheep. They found that two sheep, each receiving a daily dose of 10 g. " began to show signs of intoxication after the first week . . . and on the thirteenth day one of them died ". Holman and Pattison (1941) noted that treatment of sheep with phenothiazine increased the severity of the anaemia from which the animals were suffering as a result of parasitism, although at the same time, general growth processes appeared to be stimulated. Finally, for sheep, a private communication received by Dr. F. L. Taylor described fatal effects in three young lambs following treatment with phenothiazine.

Toxic Effects in Horses.—The literature on the toxic effects in horses was reviewed in detail by Taylor (1942); here we shall consider only what appear to be the major features of the subject.

(1) Even for horses in good condition, doses of 90–112 g. are above the limits of safety (Hatcher, 1941; Errington, 1941). Doses of about 60 g. may also cause fatalities very occasionally (Wolfe and Dennis, 1941; Schmidt, Christian and Smotherman, 1941).

(2) If the horses are in poor condition, doses of 15–45 g. can produce grievous effects (Fincher and Gibbons, 1941).

(3) The generally recommended dose for horses is 30 g., but in rare instances this may cause fatalities (Taylor, 1942). At present we can offer no real reason for this, but below in a general discussion on the problem of toxicity we suggest that it is not a case of drug idiosyncrasy but is due to some condition of diet or intestine which permits abnormally high absorption.

(4) The effects of the intoxication are more or less uniform in all the cases. There is an oligocythaemia; haemoglobinuria and albuminuria may be present, and icterus is common. At autopsy the heart, spleen, and kidneys may be found to be greatly enlarged. The full significance of these findings remains unexplained.

(5) It is necessary to emphasize the need for an adequate pathological examination in the cases of suspected phenothiazine poisoning whenever this is possible. Only in this way will other factors, which might be contributory causes in producing the general picture of intoxication, be eliminated, and the effect of phenothiazine on the body tissues become fully known. For instance, in a case reported by Innes and Whittick (1940), a nine-year-old thoroughbred mare was given a heavy dose of phenothiazine (500 g.) for experimental purposes. On the third day she became moribund and was shot. On the face of it, here was a clear case of phenothiazine poisoning, but a detailed autopsy showed the mare to have been suffering also from an advanced stage of a rare chronic progressive arterial disease identical with thrombo-angiitis obliterans in man. Clearly, knowing all the facts, we cannot definitely say that phenothiazine itself would have caused death.

Toxic Effects in Human Beings.—The earliest report of a toxic action of phenothiazine on human beings seems to be that of DeEds, Stockton and Thomas (1939), who were using the drug as a urinary antiseptic. Three of their patients, after receiving 19·9 g., 22·4 g., and 28·1 g., spread respectively over 8, 10, and 67 days, developed secondary anaemia. Hubble (1941) also showed that phenothiazine might produce haemolytic anaemia in children. He treated some 30 cases for enterobiasis and three of them developed anaemia and toxic hepatitis. Johnston (1942) described a case of toxic effect in a girl aged seven who was given 1 g. phenothiazine twice daily for five days. Treatment was followed by collapse, slight icterus, delirium, fever and increased pulse rate and anaemia. Blood transfusion was resorted to and the girl recovered. Finally, there is the fatal case already mentioned; after autopsy it was considered that " the appearance of the blood, spleen and marrow were consistent with a haemolytic anaemia . . . Sections of liver, heart and kidneys showed no microscopical evidence of toxic damage ", and there was " nothing to connect the blood transfusion with death ". Thus eight patients out of a total of about 220 have exhibited toxic effects following treatment with phenothiazine.

An interesting effect of the drug on men exposed to the sun, who were using a suspension of the substance as a spray in the control of codling moth, has been described by Newcomer (1937) and DeEds, Wilson and Thomas (1940). Some of the men complained of an intense itching, irritation and reddening of the skin, effects which sometimes approximated to those of severe sunburn. DeEds and his co-workers suggest that it is due, not to a local irritant action of phenothiazine, but to a photosensitization produced directly or indirectly by the presence of the oxidation-reduction system, thionol-leucothionol, in the tissues. The presence of this system in the tissues would be the result of the oxidation of phenothiazine taken in through the mouth. Incidentally, Swales (1940*a*) tried without result to produce the same effect in white-faced sheep by first dosing them with phenothiazine and then exposing them to brilliant sunshine. The dermatitis in pigs reported by Rietz (1942) might also be due to photosensitization.

General Discussion of the Toxicity of Phenothiazine

There is insufficient evidence available regarding the toxicity of phenothiazine for animals to make a definite statement on the conditions which govern it. We can say that this substance is a poison and that under certain circumstances its toxic qualities are sometimes accentuated, sometimes virtually inhibited, but we have only a vague idea what its particular toxic effects are, and how they are modified. The most we can do at present is to list the facts which appear to be of significance.

(1) Young animals appear to be more susceptible to phenothiazine poisoning than are older ones—witness the observations on calves, young pigs, very young lambs, and children.

(2) Different species of animals vary in their susceptibility. At the present time, taking into account all

effects, it would seem that sheep are the most resistant and horses and human beings the least. Sheep are so resistant that the prescribed anthelmintic dose may be described almost definitely as being without adverse effect on the animal. The chances of adverse effect following administration of a dose of about 30 g. (an efficient anthelmintic dose) to mature horses appears to be one in several hundreds, if not thousands.

(3) There is a great individual variation in susceptibility to phenothiazine poisoning, so much so that to quote a minimum lethal dose has no practical significance and to say that a toxic dose is so many time an anthelmintic dose is misleading. Thus there are quite a few instances in which doses of 500 g. have been given to horses without serious symptoms, but in another instance (quoted by Taylor, 1942) a dose of 27 g. killed a seven-year-old Shire horse. Clearly, general statements about phenothiazine must be guarded and qualified.

(4) The first obvious explanation of the cases of phenothiazine poisoning is that they are susceptible animals such as are found in any large population and that the accidents are a manifestation of individual variation. This is unsatisfactory because accidents appear to occur in groups ; for instance, it has been found in several horses in the same stable (Taylor, 1942 ; private communication) and it has occurred apparently with greater frequency than would be expected.

Secondly, the question of idiosyncrasy to phenothiazine might be considered. This may be differentiated from overdosage by the nature of the symptoms. In idiosyncrasy to drugs the symptoms are nearly always different from those of overdosage ; for example, in man overdosage with aspirin produces mainly gastric symptoms while small doses in an idiosyncratic person produce urticaria and facial oedema. When, however, toxic symptoms are produced by small doses of phenothiazine they resemble those of overdosage and on these grounds idiosyncrasy can be ruled out. In support of this it can be stated that it is extremely unlikely that idiosyncratic individuals should occur at the same time in the same stable as has happened with some horse cases.

A third possibility remains. Phenothiazine will kill Protozoa such as *Paramoecium* within 10 minutes or so when they are kept in a very fine suspension of it in water (personal observation). It is an effective insecticide for at least some forms such as the codling moth (Smith, Munger and Siegler, 1935). It will inhibit the development of nematode eggs if it is mixed into a faecal culture, and it will kill the pre-infective larval stages of intestinal nematodes (Taylor and Sanderson, 1940 ; Shorb and Habermann, 1940 ; personal observations). We know that it kills many types of adult nematodes, and we know, too, that on occasion it will kill the mammalian host. We are thus justified in describing it as a poison. Now the doses which have been given to some animals without causing obvious ill effects have been relatively enormous—400 g. to a sheep, 500 g. to a horse—but we cannot believe that any appreciable amount of such doses could exist in the internal medium of an animal at one time without producing toxic effects. In other words absorption must proceed normally at a low level, and excretion must be rapid, which, as we have seen, is probably true (Swales and Collier, 1940). The question naturally presents itself : would an upset of this normal mechanism of a low level of absorption and quick excretion produce toxic effects ? We do not, however, know the conditions which make for an increased absorption of the drug, but possibly some abnormality of the intestinal tract, or a dietary factor, may play a part (see also Taylor, 1942).

(5) Surveying the results so far to hand we cannot help being struck by an apparent correlation between toxic effect and repeated small doses. Thus the human patients have invariably been given repeated doses and the proportion, about 3%, showing adverse effects is quite high. Then it seems that sheep can be caused to show symptoms of intoxication by feeding repeated small doses, whereas perhaps two or three times the total sum of the small doses, administered as a single dose might have no ill effect. Finally, there is a suggestion that horses are more prone to show toxic effects following a second dose than they are following the initial dose. As we have remarked above, we believe that there is sufficient correlation to warrant the suggestion that, if phenothiazine is used again in human beings, a trial should be made of one big dose instead of a series of small doses. Regarding this correlation it should be noted, however, that Eddy, Cox and DeEds (1937, quoted by Taylor, 1942) showed that rats could withstand a daily dosage up to 0·25% by weight of their diet for 295 days. Also McCulloch and Seghetti (1942) report an experiment in which a pig weighing 110 lb. was given 30 g. of phenothiazine daily for 42 consecutive days, a total of 1,260 g., and no effect was observed other than a small reduction in its haemoglobin concentration.

* * *

We have considered the toxicity of phenothiazine at some length because it is this factor which determines whether the substance stands or falls as a good anthelmintic. On the face of it there are many reports of its toxic action ; actually the number is low when we take into account the widespread use which the drug has received during the past few years. As we have already remarked, the chances of adverse effect following the administration of an anthelmintic dose of about 30 g. to sheep appear to be negligible, and, following a similar dose to horses, appear to be one in several hundreds if not thousands. The evidence for adult cattle and pigs also seems to justify their being regarded as reasonably safe subjects. But we would stress again the need for care in giving phenothiazine to young animals, particularly young pigs and cattle, and to children. Finally, we advise strict adherence to the minimum adequate anthelmintic dose, which may seem a trite remark, but if this procedure had been followed in the past some, at least, of the cases of toxic action would not have been reported.

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DISEASES CAUSED BY BACTERIA AND FUNGI

STIRLING, A. C. (1940). **A Comparison of Certain Solid and Liquid Media for the Bacteriological Diagnosis of Mastitis.**—*Proc. Soc. agric. Bact.* ***1940.*** pp. 32–33.

Using Edwards' crystal-violet aesculin blood agar as a standard medium, S. compared it with the sodium azide broth medium also described by Edwards. Milk samples were taken into tubes containing sufficient sodium azide to give an approximate concentration of 1 : 20,000 ; bromcresol purple was used as an indicator. The milk samples were left at room temperature overnight, and the next day a loopful of gravity cream was plated in the depth of the crystal-violet aesculin blood agar and into the sodium azide broth. Floccular deposits in the broth were plated on to the blood agar medium. All suspicious colonies were identified biochemically.

Out of 958 quarter samples tested, 164 were positive by one or both methods, 159 (97%) were positive by plating, while 93 (57%) were positive in the liquid medium.

In a subsequent test the liquid medium was modified, the concentrations of crystal violet and sodium azide being reduced by one half. Using this modified liquid medium 1,011 quarter samples were examined. There were 132 positive samples by one or both methods, 122 (92%) were positive by plating, and 97 (73%) were positive in the broth.—D. L. HUGHES.

INCZE, K. (1941). Das kulturbiologische Verhalten aus Milchproben stammender Streptokokken. **[Cultural and Biological Characters of Streptococci from Milk Samples].**—*Wien. tierärztl. Mschr.* **28.** 410. [Abst. only given].

Using appropriate culture media 115 colonies were separated into pathogenic and nonpathogenic strains. The media used are discussed.—J. G. CARR.

NOTTBOHM, H. (1940). Sind alle in der Milch vorkommenden hämolytischen Streptokokken vom Pyogenes-Typ menschenpathogen ? **[Pathogenicity for Man of Haemolytic Streptococci of the *pyogenes* Group Occurring in Milk].**—*Z. Hyg. InfektKr.* **122.** 594–602.

A review dealing with the serological and biochemical classification of strains of *Str. pyogenes* isolated from bovine udders and/or milk.

N.'s own observations are limited to a single case of bovine mastitis which proved to be due to infection with *Str. pyogenes*. The causal organism belonged serologically to Lancefield's group C, and was identified, by its action on sorbitol and trehalose and on human fibrin, as being of the " animal *pyogenes* " type.

In order to test the pathogenicity of this type for man, N. and a colleague consumed increasing amounts (up to 50 ml. each) of milk from a cow artificially infected with this strain, each ml. containing at least 1½ million organisms. No ill-effects were experienced. The view of American workers that group C " animal *pyogenes* " occurring in milk is non-pathogenic for human beings is therefore confirmed.—M. LANDAU.

HARRISON, J. (1942). **A Note on the Examination of Nose, Throat and Vaginal Swabs and of Dung Samples for the Presence of *Str. agalactiae*.**—*Vet. Rec.* **54.** 51.

Nose and throat swabs were taken from 74 cows, only six of which did not excrete *Str. agalactiae* in the milk. Vaginal swabs were obtained from 20 virgin heifers and 56 cows of which 15 were harbouring *Str. agalactiae* in the milk. Faecal samples from 24 cows with streptococcal mastitis were also taken.

The swabs from all sites were plated direct on to Edwards' crystal-violet aesculin blood agar and also incubated in glucose lemco broth.

Any suspicious colonies were examined biochemically and with group B serum by Lancefield's technique. No group B streptococci were isolated.—D. L. HUGHES.

NAMIKAWA, S., & SATO, A. (1941). **On the Type Differentiation of Hemolytic Streptococci Isolated from Strangles, Pneumonia and the Other Streptococcal Diseases of Equines. III. The Relation between Type Differentiation and Virulence towards Laboratory Animals.**—*Jap. J. vet. Sci.* **3.** 337–347. [In Japanese : abst. from English summary]. [For part II, see *V. B.* **12.** 193].

Reference is made to previous classification by biological and serological tests of 190 strains of haemolytic streptococci isolated from 89 horses, by which types of *Str. equi* and its variants, types C and F, and types A and B of *Str. pyogenes* were differentiated. Differences in virulence of these strains towards mice, g. pigs, and rabbits are now recorded. The original type G strain of *Str. equi* was very virulent for mice, but far less so for g. pigs and rabbits. Type A of *Str. pyogenes* and the F variant of *Str. equi* were highly virulent for all three test animals. Type B of *Str. pyogenes* was of almost equally low virulence for all three test animals. Type C of *Str. equi* was of intermediate virulence for mice and almost nonpathogenic for the other two animals.

It was noted that all these equine types of streptococci tended to cause arthritis in rabbits if a small dose was given intravenously. Short-chained forms of the G type of *Str. equi* and its C variant and long-chained, usually diplococcal, forms of the F variant of *Str. equi*,

and both types of *Str. pyogenes* were recovered from the spleens of inoculated mice.—C. V. Watkins.

Krabb, R. (1941). Ueber einen bösartigen Verlauf der Druse und einer sich anschliessenden infektiösen Bronchopneumonie im Fohlenaufzuchthofe in Zams-Tirol. **[An Outbreak of Malignant Strangles Followed by Infectious Broncho-Pneumonia in a Foal-Rearing Stud in Zams (Tyrol)].**—*Z. Veterinärk.* **53.** 243–245.

A severe outbreak of strangles occurred in a foal-rearing establishment nine days after the introduction of 18 foals of the local Muli breed. Among the newly introduced animals the disease was fairly mild, there being abscesses in the submaxillary lymph nodes which required incision in only a few cases and rapid recovery except in a few foals in which a mild cough persisted for some time.

Among foals of the Haflinger breed which had been longer on the premises, the disease was far more serious. The abscesses were larger and filled with a pale yellow, thin pus, and they required incision and repeated irrigation. In some animals the inflammatory reaction was distributed diffusely throughout the soft tissues of the head and not confined to localized lesions. This diffuse suppuration resulted in as many as 20–30 sinuses opening to the overlying skin. In spite of careful treatment and hygienic measures a number of foals in which the primary suppurative process had healed developed a sudden rise of temperature to 104°–106°F., dry cough, and symptoms of pneumonia. Some of these animals died 2–3 weeks later and showed at autopsy a severe gangrenous and purulent pneumonia. Of the 82 " Haflinger " foals nine died, five being two-year-olds and four yearlings.

K.'s explanation of the striking difference in severity of the disease in the two breeds is increase of virulence of the streptococci when transmitted to the "Haflinger" foals among which there had been no previous outbreak of infectious disease. Isolation of newly introduced foals for 2–3 weeks and careful observation during this time is recommended to avoid such outbreaks in the future.—E. G. White.

*Jansen, J. (1940). Goedaardige droes, adenitis equorum. Klinische-bacteriologischeles over Streptococcus equi-, Streptococcus pyogenes- en andere streptocceninfecties bij hat paard. **[Benign Strangles. Clinical-Bacteriological Research on *Str. equi*, *Str. pyogenes*, and Other Streptococcal Infections in the Horse].**—*Tijdschr. Diergeneesk.* **67.** 741–753. [Abst. from abst. in *Zbl. Bakt. I.* (*Ref.*). **139.** 332].

Str. equi was isolated from 12 typical cases of strangles and from one mild case. *Str. pyogenes* (animal type) was isolated once from pleural exudate, from a submaxillary lymph node, from abscesses, and from the nasal discharge [presumably from different cases]. Streptococci causing greening and haemolysis of blood agar plates were isolated from the kidneys and spleen of one dead horse and from the submaxillary lymph nodes of another.

Hofferber, O. (1941). Blutbild bei Drusenmetastasen. **[Blood Picture in Strangles with Metastases].**—*Z. Veterinärk.* **53.** 241–243.

A four-year-old mare in poor condition was subjected to a careful clinical examination and the only positive finding was a hard tumour-like mass, estimated to be about 20 × 10 × 6 cm. in the region of the mesenteric lymph nodes. The case was ultimately found to be one of " bastard strangles ". The intradermal tuberculin test was negative. Examination of the blood on three successive days showed a marked neutrophile leucocytosis (total white cells 10,800–16,700 ; neutrophiles 59–81%).—E. G. White.

Benedict, R. G., Wisnicky, W., & McCoy, E. (1941). **Subacute Arthritis and Septicemia of Streptococcal Origin in Silver Foxes.**—*J. Amer. vet. med. Ass.* **99.** 498–502.

A brief review is given of the literature relating to streptococcal septicaemias in silver foxes, horses, and dogs. Three cases are then recorded of streptococcal arthritis and two of streptococcal septicaemia in silver foxes from which types of the " animal *pyogenes* " or Lancefield group C streptococci were isolated. Ten days before the first two deaths, the foxes had been fed on meat from a horse with a large abscess in the pectoral muscles, and this is believed to have been the source of infection. No disease could be set up in two red foxes by feeding a culture obtained from one of the arthritis cases.—C. V. Watkins.

Solotorovsky, M., & Buchbinder, L. (1941). **Dissociation of Beta Hemolytic Streptococci Revealed by Size of Hemolytic Zone on Blood Agar Plates.**—*J. Immunol.* **40.** 243–252.

A culture of group A streptococci isolated from an upper respiratory infection was found to produce two types of colony differing in the size of the haemolytic zone, and this appeared to be correlated with colonial type and mouse pathogenicity. A culture from a single S colony of the large haemolytic type gave rise with mathematical precision to the small haemolytic matt variant which was of greater virulence. Culture of the heart blood of mice inoculated with the large haemolytic type predominantly yielded the small haemolytic type, whereas culture of heart blood of mice inoculated with the small haemolytic type yielded only the same type. When sown into human blood only the small type multiplied vigorously. Both types were precisely similar serologically and biochemically.—D. L. R.

Krpan, V. (1939). Studie hnilobnych pochodu a biologické sterilisace uhlákovych spor v kalech z kozeluzen. **[The Decomposition and Biological Sterilization of Anthrax Bacilli in Tannery Waste].**—*Zverolék. Rozpravy.* **13.** 67–87.

An account of experiments carried out to determine whether tannery effluents possess specific anthracidal properties. It was found that anthrax spores in putrefying tannery waste kept at 12°–15°C. retained their full virulence after 78 days. Effluent mixed with chemicals did not destroy the spores after two weeks at 37° C., because the chemicals inhibited vegetation of the spores. When the chemicals were removed, the spores were destroyed in two weeks at 37°C. by the putrefactive processes, and even more readily in the presence of *Pseudomonas pyocyanea* or yeast. K. concludes that in nature, physical and biochemical influences are the most important causes of destruction of the vegetative form of anthrax bacilli.—O. Spirmann.

*Kujumgiev, J. (1940). Contributo alla conservazione della fissità del grado di virulenza dei vaccini anticarbonchiosi attenuati. **[The Conservation of Virulence in Anthrax Attenuated Vaccine].**—*G. Batt. Immun.* **24.** 92–96. [Translation of abst. in *Zbl. Bakt. I.* (*Ref.*). **139.** 307].

K. found that the Pasteur second anthrax vaccine is not able to preserve its virulence in broth without peptone and salt, but it retains virulence in a 3% ammonium chloride solution.

Beller, K. (1941). Untersuchungen über Ziegentuberkulose. I. Häufigkeit und Typenzugehörigkeit nach Schlachtbefunden. **[Research on Caprine TB. I. Frequency and Type of Bacillus in Cases Found at Slaughter].**—*Arch. wiss. prakt. Tierheilk.* **77.** 1–8.

Beller, K., & Ehrenreich, W. (1941). Unter-

suchungen über Ziegentuberkulose. II. Experimentelle Untersuchungen über Infektion und Infektionsabwehr bei der Ziegentuberkulose. [**Research on Caprine TB. II. Research on Infection and Resistance of Goats**].—*Ibid.* 9–27.

I. The literature on caprine TB. is discussed. German abattoir statistics revealed a percentage infection rate of 0·71 over the period 1904–20 and one of 1·02 over the period 1920–37. The condition appears to be most prevalent in Oldenburg and then Saxony. A large proportion of goats, however, are never sent to abattoirs, so the true infection rate is unknown.

B. observed 35 tuberculous goats and/or tuberculous organs from goats during the previous two years and carried out type determination tests by cultural methods, in preference to animal inoculation, using a modified Petragnani medium, replacing potato by bean meal and Witte peptone by "Pept. sicc. e caseino", with and without glycerin. By this means all the 35 cases proved to be of the bovine type.

II. Observations were made on nine goats, five suspected of being tuberculous and four being healthy goats which were experimentally infected. In each case the complement-fixation and tuberculin tests were carried out *intra vitam* and pathological and bacteriological examinations were made P.M. All the suspected animals were tuberculous (bovine type of bacillus) and all of them reacted serologically and allergically. The lesions were of a localized exudative character. The goats proved to be very sensitive to the tuberculin test (single intradermal); a skin thickness increase exceeding 4 mm. was taken as positive. The c.-f. test was considered valuable as an indication of the progressiveness of the infection.

Two healthy goats were infected experimentally with bovine type tubercle bacilli, one with human type, and one with avian type bacilli and all developed local TB. and reacted to the diagnostic tests with great specificity between mammalian and avian tuberculin. The goat infected with the avian type bacillus developed a mesenteric lymph node tubercle from which the avian type bacilli were isolated, and was also found to have a tuberculous lung from which bovine type bacilli were isolated. This goat reacted only to avian tuberculin.

In none of the nine goats was the udder infected.

—J. E.

Hadwen, S. (1942). **Tuberculosis in the Buffalo.**—*J. Amer. vet. med. Ass.* **100.** 19–22.

For more than 26 years, a herd of American bison was maintained in the National Buffalo Park, at Wainwright, Alberta. The herd was started by the purchase of 631 animals from Montana, U.S.A., in 1906–7, and of 111 at various times from other parts of Canada. From 1914, when the last purchases were added to the herd, until 1923, there was apparently no outward sign of TB. In 1923, surplus animals, mainly old bulls, in the herd were killed off, over 76% showing lesions of TB. Rather lower percentages were seen at subsequent killings, the percentage in 1939 being just over 30. The original source of infection was apparently among the animals bought in Canada, as other animals from the herd in Montana had remained free from TB. in another park in Alberta. Infection may have arisen by feeding bison calves on domestic cow's milk. Apparently the disease spreads easily among bison, but the animals become tolerant and mostly live to old age, even though some at slaughter show lesions of generalization. Attempts to eliminate the disease by slaughter of old animals and moving the younger animals to fresh ground, were not wholly successful.—E. Cotchin.

Hillermark, K. (1940). Om fågeltuberkulos, dess frekvens och roll som smittkälla. [**Avian TB., its Frequency and Role as a Source of Infection**].—*Skand. Vet Tidskr.* **30.** 918–931. [English summary].

A general review with some new compilations of records from Sweden. Between 1920 and 1939, 6% of all fowls examined P.M. at the State Veterinary Bacteriological Institute were tuberculous. The incidence was, however, nearly double that figure for the southern provinces and for Gotland island. Records are also given for TB. in birds other than chickens in Sweden, amounting to 41 cases among 1,745 birds, both domestic and wild.

The frequency of infection of the internal organs is discussed as is also egg infection, which is remarkably low in infected hens. Records from Germany, Sweden, and the U.S.A. showed that only 12 out of 2,995 eggs laid by tuberculous hens were infected. It was found that boiling for 4 min. was sufficient to kill tubercle bacilli in eggs.

Avian type infection occurs in many mammals and very commonly in swine in certain places. Thus 130 of 164 cases of TB. in swine in Norway in which type determination was carried out, were of the avian type. Some figures of other workers in England, Belgium, Denmark, Finland, Germany, Sweden, and the U.S.A. are also given. The number of cases on record of avian type TB. in man is not small.—J. E.

Gróh, E., & Remete, T. (1939). Studien über das gleichzeitige Vorkommen von humanen und bovinen Bazillen bei der Nierentuberkulose. [**Simultaneous Presence of Human and Bovine Type Bacilli in Kidney TB. in Man**].—*Zbl. Bakt. I.* (*Orig.*). **143.** 335–344.

Strains of tubercle bacilli isolated from 49 cases of renal TB. and four cases of TB. of the testicle and epididymis were typed. When the ordinary methods of typing were used, 43·4% of the strains were typed as bovine. When a special method, previously described by Gróh was used it was found that in all 53 cases bovine tubercle bacilli were present, either alone or together with the human type. The avian type of tubercle bacillus was not found.

[The method used by Gróh consists in isolation on Löwenstein's medium, examination of young colonies under a magnification of × 10, and of stained smears, and differentiation of human and bovine type bacilli on morphological grounds. Colonies containing a high proportion of the bovine type are chosen for subculture so as to enable this type to be recognized in presence of the more rapidly growing human type. Finally, the organism is inoculated into rabbits and g. pigs. By this method Gróh claims that in all forms of TB. in man except the pulmonary the bovine type of tubercle bacillus far exceeds in number the human type. Those interested in these unorthodox views should consult the original article.]—E. G. White.

Hunter, R. A. (1941). **The Tubercle Bacillus in Sputum: with Special Reference to Branching Forms.**—*Tubercle, Lond.* **22.** 257–265.

During the routine examination of human sputa, H. made a study of branching forms of *Mycobacterium tuberculosis*. He classifies the bacillus into three classes according to size, recognizing (1) small bacilli 1–3 μ in length arranged in impacted clumps, (2) intermediate forms of 3–5 μ, and (3) long forms of 5–20 μ. A survey of 50 specimens exhibiting complex structures showed that there were no branched forms in four belonging to group (1), but that they were present in 14 out of 22 in group (2), and in 22 out of 24 in group (3). The frequent occurrence of branching in avian strains is discussed. It is stated that microscopic evidence of the morphology of tubercle bacilli in sputum depends on the use of picric acid as the counter stain.

—R. E. Glover.

BIRKHAUG, K. (1941). Eksperimentelle og kliniske undersøkelser av Rosenthal's perkutane BCG vaksinasjonsmetode. **[Experimental and Clinical Investigation of Rosenthal's Percutaneous BCG Inoculation].** —*Nord. Med.* **10.** 1224–1230. [Abst. from English summary].

As a result of experiments in mice and in the g. pig, B. recommends the percutaneous inoculation of BCG vaccine elaborated by ROSENTHAL [*V. B.* **9.** 820.] as the method of choice. The reaction to the vaccine is very slight and produces no suppuration of adjacent glands nor visible scars. Following inoculation, Mantoux tuberculin reactions are positive in 2–4 weeks, at which time resistance to infection with virulent tubercle bacilli is marked. Positive tuberculin reactions persist for at least 14 months after vaccination.—R. E. GLOVER.

SAXINGER, G. (1941). Die theoretischen Grundlagen, die Nachteile und Vorzüge der Rotlauf-Schutzimpfung mit Kultur-Serum-Gemisch. **[The Theoretical Basis, Advantages, and Disadvantages of Culture Plus Antiserum Immunization against Swine Erysipelas].**—*Berl. Münch. tierärztl. Wschr.* July 11th. 333–335.

The advantages of immunization against swine erysipelas by serum-culture mixture are discussed. The method advocated consists of the injection of 5 ml. of mixture, containing one part of culture to ten of serum, for pigs of 50 kg. body weight. S. vaccinated 5,000 pigs by this method without mishap. The mixture should be used within two hours of preparation. It is claimed that the serum preservative has no detrimental effect on the immunizing power of the culture when used in this way and that a greater degree of accuracy in vaccination can be attained than by the separate injection of serum and culture.—D. L. ROBARTS.

HARBOUR, H. E. (1941). **Listerella Infection in a Calf in North Wales.**—*Vet. J.* **97.** 401–406.

A typical listerella organism was isolated from a nine-day-old calf, which had died after seven days' severe and persistent diarrhoea; this is the first recorded instance of naturally occurring infection in a bovine in Great Britain. P.M. findings were congestion, haemorrhages, and ulceration of the abomasal mucous membrane, patchy congestion of the ileum, studding of the liver with minute necrotic foci, and slight haemorrhage under the mitral valve. The brain was not examined. Listerella were recovered in almost pure culture from the liver, gall bladder, and lungs, and not from the abomasum, but smears from the abomasal ulcers showed clumps of small Gram-positive rods. Infection is considered possibly to have been by ingestion, but the source of the infection could not be determined, although suggestive agglutination titres were given by the serum of the calf's mother, and of several fowls of a flock kept on free range on the farm.

H. lays stress on the significance of the recorded isolation of a listerella organism, in view of the wide range of pathogenicity of these organisms and of the possibility of transmission between different animal species.—E. COTCHIN.

BIESTER, H. E., & SCHWARTE, L. H. (1941). **Bovine Listerellosis in Iowa With Studies on a Recovered Case.**—*N. Amer. Vet.* **22.** 729–734.

Listerella infections were first recorded in cattle in Iowa in 1938. Since then several cases have been observed. One practitioner saw seven positive cases in one year, and three positive cases were submitted for examination by another veterinarian, who diagnosed clinically three other outbreaks in his practice. Another practitioner saw outbreaks in three herds. All the outbreaks were verified in the laboratory. The chief symptoms were central nervous disturbances, with death after a varying period of time, or, in mild cases, recovery. The diagnosis of listerellosis is a matter for a laboratory and rests on cultural and pathogenicity tests. The symptoms noted and lesions subsequently found in an apparent case of recovery in a Hereford steer, are described in detail.—E. COTCHIN.

NYFELDT, A. (1940). Listerella monocytogenes, dens betydning i human e veterinaermedicinen. **[*L. monocytogenes* in Human and Veterinary Medicine].**—*Skand. Vet Tidskr.* **30.** 280–285. [English summary].

A review of the literature, both medical and veterinary. N. states that HÜLPHERS in Sweden was the first to discover *Listerella*. He observed it in 1911 in a case of rabbit septicaemia.—J. E.

TOPACIO, T. (1940). **An Outbreak of Haemorrhagic Septicaemia in Indian Buffaloes.**—*Philipp. J. Sci.* **71.** 125–131.

This is substantially the same as a paper published elsewhere [see *V. B.* **10.** 77].

*LINSERT, H. (1940). Pasteurellose beim Nerz. **[Pasteurella Infection in Mink].**—*Dtsch. tierärztl. Wschr.* **48.** 433-435. [Abst. from abst. in *Zbl. Bakt. I.* (*Ref.*). **139.** 342].

A record of bacteriologically proved pasteurella infection in mink.

EY, L. F., & DANIELS, R. E. (1941). **Tularaemia in Dogs.**—*J. Amer. med. Ass.* **117.** 2071–2072.

A record of tularaemia in three dogs in Ohio which were given the carcass of a captured wild rabbit by their owner who contracted a fatal infection. The dogs became ill but recovered. Serum agglutination tests confirmed the diagnosis.—J. E.

NOBREGA, P. (1940). Artrite em galinha produzida por "Bacterium arthropyogenes", n.sp. **[Arthritis in Fowls caused by *Bacterium arthropyogenes*].**—*Arq. Inst. biol., S. Paulo.* **11.** 323–331. [English summary].

N. describes a form of purulent arthritis in fowls apparently caused by an aerobic bacillus which grows well in ordinary media. It occurs as small Gram-negative rods of 1·5–3μ × 0·5–0·7μ, is non-motile, non-acid-fast, non sporing, and not encapsulated. In smears from agar cultures the organisms occur singly or in pairs, some with distinct bipolar staining; in broth, short chains are formed and filaments up to 8μ which stain irregularly, are found. The cultural characters are described. Acid but no gas is produced in glucose, sucrose, maltose, xylose, dextrin, and rhamnose, while lactose, mannitol, salicin, and dulcite are not affected even after 30 days. Litmus milk is acidified in 24 hours but is not clotted. The organism does not produce indole or H_2S, and the Voges-Proskauer reaction is negative. It reduces nitrates and produces ammonia. The catalase test is positive.

In fowls the organism gives rise to large abscesses in and around the joints and to small abscesses in the liver. These lesions were produced by intravenous and intra-articular inoculation. Rabbits, g. pigs, and mice were not susceptible.—MILLER WATSON.

GAITANDJIEFF, G. (1940). Drei Fälle von Endocarditis verrucosa beim Schwein, verursacht durch Bac. coli. **[Three Cases of Endocarditis verrucosa in Swine Caused by *Bacterium coli*].**—*Berl. Münch. tierärztl. Wschr.* Aug. 23rd. 409–411.

A general discussion of endocarditis in swine, especially as seen in cases of erysipelas. Three cases, in which *Bact. coli* was the cause of a verrucose endocarditis, are described in detail. It is stated that verrucose endocar-

ditis is not pathognomonic of chronic erysipelas, and the danger of diagnosing erysipelas simply from the presence of this lesion is stressed.—E. COTCHIN.

EDWARDS, P. R., & BRUNER, D. W. (1941). **The Beta Phases of the Genus Salmonella with Special Reference to Two Undescribed Salmonella Types.**—*J. infect. Dis.* **69.** 220–223.

In a study of the α-β phase variation of the flagellar antigens of the salmonella group, the β phases were shown to be divisible into five types, the antigenic characteristics of which were delineated by means of agglutinin-absorption tests, sera against one representative of each type of β phase being used. Two new salmonella types are described, *S. hartford* from a case of human enteritis and *S. urbana*, one strain from a case of porcine haemorrhagic enteritis and one from the intestinal tract of a chicken. The antigenic formulae of both types were determined by serological investigation of the somatic and flagellar antigens. The O antigen of *S. hartford* was identical with that of *S. cholerae-suis*, while that of *S. urbana* was unrelated to the O antigens of the known salmonells types. The β phase of *S. hartford* was assigned to the *S. abortus-equi* type and that of *S. urbana* to the *S. abortus-bovis* type. —R. O. MUIR.

KULP, W. L., YOUNG, R., & HOULIHAN, R. (1941). **Stability of a Strain of Salmonella.**—*J. Bact.* **42.** 643–652.

A typical S strain of *S. schottmülleri* obtained by Gillespie's method of single cell isolation was compared serologically with regard to the specific and nonspecific H components of the antigen with a strain of *S. typhi-murium* before and after serial passage through eight white mice, eight white rats, and 50 white mice respectively. Serological analysis of the *S. schottmülleri* strain was made by agglutinin-absorption tests with flagellar antisera after each animal passage. Antisera prepared against strains isolated from passage animals were also analysed and a control experiment was made to determine whether any change occurred in *S. schottmülleri* under laboratory culture conditions by passage on a variety of agar media. The authors concluded that the stability of a fixed type of salmonella could not appreciably be disturbed by animal passage.—R. O. MUIR.

GOTOH, J., & NAKAYAMA, T. (1941). **Toxic Substance in Pathogenic Micro-Organisms. I. The Toxin of *Salmonella pullorum*.**—*Jap. J. vet. Sci.* **3.** 205–222. [In Japanese : abst. from German summary].

A suspension of the organism was heated to 60°C., centrifuged, passed through a Seitz E.K. filter, HCl added until a pH of 2 was reached, and then 3 vol. of acetone added. The precipitate was purified by dialysis and by three further precipitations with acetone, and the resulting white powder contained 1·6–1·9% N, and formed an osazone after hydrolysis by HCl. Intravenous injection into mice and rabbits was fatal in 24–72 hours, causing paralysis, diarrhoea, and bleeding and congestion of the intestinal mucosa. The M.L.D. for white mice was 0·13 mg. per 10 g. body weight, that from organisms grown on a glucose-agar plate 0·016–0·13 mg.—J. G. CARR.

HEDSTRÖM, H. (1941). En paratyfusenzooti orsakad av Salmonella typhi murium, hos fjäderfä med överföring till människam. [*S. typhi-murium* **Infection in Poultry and Transmission of Infection to Man**]. —*Skand. VetTidskr.* **31.** 98–118. [English summary].

A detailed description of an outbreak of *S. typhi-murium* infection among fowls, geese, and turkeys on a farm. The infection was traced to a compost heap containing carcasses of minks from a nearby mink farm. Turkeys alone had access to the heap and it was considered that infection spread to the other birds *via* turkey eggs and/or poults.

The family of the owner became ill with paratyphoid and identical strains of *S. typhi-murium* were isolated from them and from the majority of the poultry. Details are given about the serological and bacteriological work.—J. E.

*CORDES, R. (1939). Ueber das Vorkommen von Brucella abortus in Organen von Kühen und Kälbern mit verschiedenen serologischen Befunden. [**A Comparison between the Occurrence of *Br. abortus* in the Organs of Cows and Calves and Reactions to the Agglutination Test**].—*Inaug. Diss., Hanover.* [Abst. from abst. in *Zbl. Bakt. I.* (*Ref.*). **139.** 316].

The organs of 12 cows and six calves were examined culturally and by animal inoculation. In five cows reacting at a titre not over 1 : 100, no organisms were found, but in seven cows reacting at 1 : 200–1 : 3,200 brucella were found in the udder of all, in the supramammary lymph nodes of 6, in the milk of 5, in the uterus of 4, in the renal l.nn. of 3, in the spleen, kidneys and hepatic l.nn. of 2, and in the liver and iliac l.n. of one.

Brucella were found in the mesenteric l.nn. of two newborn calves (three and nine days old) born of infected cows. The calves reacted negatively to the agglutination test and positively to the flocculation test.

*JERZEMBECK, R. (1939). Untersuchungen über den Cholesteringehalt des Rinderblutes unter besonderer Berücksichtigung des Bangschen Abortuserregers. [**Cholesterol Content of Bovine Blood with Reference to Serological Tests for *Brucella abortus***].—*Inaug. Diss., Hanover.* [Abst. from abst. in *Zbl. Bakt. I.* (*Ref.*). **139.** 322].

From tests on 400 cattle, J. found that the cholesterol content of the blood serum decreased as the agglutination and complement-fixation titres rose.

*FELIKS, R. J. (1940). [**Transmission of Brucellosis from Human Beings to Sheep by Urine**].—*Ber. Mikrobiol. Epidemiol. u. Parasitol.* **18.** 127–132. [In Russian]. [Translation of abst. in *Zbl. Bakt. I.* (*Ref.*). **139.** 316].

The urine of persons affected with undulant fever can cause brucella infection in sheep. The presence of brucella in ewe's milk can be demonstrated by the mouse test.

*CASTAGNOLI, B. (1940). Le agglutinine antibrucellari nel siero del cane. [**Positive Reactions to *Brucella melitensis* in Dogs in Rome**].—*R. C. Ist. Sanit. pubbl., Roma.* **3.** 593–602. [Abst. from abst. in *Zbl. Bakt. I.* (*Ref.*). **139.** 319].

Only two out of 148 dogs living in the Agro Romano reacted to the *Br. melitensis* antigen agglutination test.

*LORBER, B. B., & KISSELGOV, A. B. (1939). **Viability of Brucella in Pox Debris.**—*J. Microbiol., Moscou.* **6.** 193–199. [In Ukrainian]. [Translation of abst. in *Zbl. Bakt. I.* (*Ref.*). **139.** 276].

Experiments showed that brucella cells can remain alive for a long time in glycerin and in pox debris. In some cases brucella grew in pox debris 78–86 days after inoculation. The authors state the necessity to test all calves used for the production of pox lymph for brucella infection.

*GRUMBACH, A. (1940). Die Febris undulans als Berufskrankheit und Unfallfolge. Kritisch epidemiologische Betrachtung. [**Undulant Fever as an Occupational Disease. Critical Epidemiological Con-**

sideration].—*Rev. suisse Accid. Trav.* **34.** pp. 90. [Abst. from abst. in *Schweiz. Arch. Tierheilk.* **83.** 138–149].

The original is evidently an extensive review of the literature on undulant fever with some original observations from Switzerland. The abstract appears to give much of the substance of the original and can be used as a source of much factual data on the subject.

The thesis discusses epidemiology, animal carriers, viability of brucella, incubation period, incidence of infection in animals and man, infection atria, sex and occupation incidence, and case records.

*Leccisotti, G. (1940). Saggi sperimentali sulla immunizzazione attiva contro la febbre ondulante mediante il latte inquinato e pasteurizzato. [**Experimental Immunization against Brucellosis by Pasteurized Infected Milk**].—*Pathologica.* **32.** 341–342. [Abst. from abst. in *Zbl. Bakt. I.* (*Ref.*). **139.** 323].

Rabbits which were given for a period of 1–2 months, daily doses of 10 ml. of milk, previously infected by 500 million brucella organisms and pasteurized for 30 min. at 65°C., developed specific agglutinins at a titre of 1 : 800–1 : 1,600.

*Sforza, M. (1940). Pluralità di specie del cosidetto "Actinomyces farcinicus". [**Plurality of Species of *A. farcinicus***].—*Arch. ital. Sci. med. colon.* **21.** 406–418. [Abst. from abst. in *Zbl. Bakt. I.* (*Ref.*). **139.** 431].

"Bovine farcy" is caused by a variety of organisms, of which S. recognizes five distinct species, *viz*, *A. albido-flavus*, *A. albus*, *Asteroides asteroides*, *Ast. granulosus* and *Ast. mucosus*: the last two are named by S. The disease occurs in a mild form in Europe and in a more severe form in the tropics (India, Africa). *Actinomyces* infections cause lymphangitis and *Asteroides* infections a pulmonary disease. The cultural characters of *Asteroides* are described. It is pathogenic for calves, mice, rabbits, g. pigs, and monkeys, but not for dogs nor fowls, and causes allergic sensitization against avian tuberculin.

Reis, J. (1940). Queratomicose aspergílica epizoótica em pintos. [**Keratomycosis in Chicks caused by *Aspergillus fumigatus***].—*Arq. Inst. biol., S. Paulo.* **11.** 437–450. [English summary].

A disease of chicks caused by *A. fumigatus* is described. It begins as a keratitis which might be confused with fowl coryza; in the early stage there are opaque areas on the cornea, but as the disease progresses the whole eye becomes affected. A caseous exudate covers the cornea in advanced cases and there is considerable oedema of the lids and conjunctivae. Frequently only one eye is involved. Most often the eye is completely destroyed, but sometimes fibrosis supervenes and some semblance of eyeball is left. *A. fumigatus* is readily isolated from the lesions and can be demonstrated microscopically in them. There is great infiltration by eosinophiles. The sinuses, air-sacs, and lungs are sometimes affected by the disease. The condition was transmitted experimentally by intracorneal inoculation.

In examining sections of affected cornea care must be taken since the refractive index of the fungus is very near that of the corneal material.

The source of the outbreak described was stated to be sawdust used for litter.—Miller Watson.

*Krantz, W. (1940). Mikrosporon equinum (Bodin 1898). [*Microsporon equinum*].—*Arch. Derm., Berl.* **181.** 234–238. [Abst. from abst. in *Zbl. Bakt. I.* (*Ref.*). **139.** 428].

A record of *Microsporon* ringworm in horses in Germany and a description of its transmission to g. pigs, rabbits, and man.

Fildes, P. (1941). **Inhibition of Bacterial Growth by Indoleacrylic Acid and its Relation to Tryptophan; an Illustration of the Inhibitory Action of Substances Chemically Related to an Essential Metabolite.**—*Brit. J. exp. Path.* **22.** 263–298.

When *Bacterium coli* was grown under certain conditions, indoleacrylic acid had a marked inhibitory effect on the enzymic synthesis of tryptophan from indole. Experiments were made to see if this relationship between indoleacrylic acid and tryptophan would confirm the theory of the chemotherapeutic interference of sulphanilamide with the metabolism of *p*-aminobenzoic acid. Controlled tests showed that tryptophan specifically counteracted the inhibitory effect of indoleacrylic acid on the growth of *Bact. coli* and *Salmonella typhi*. From these results and after a discussion of the findings of other workers, F. concludes that the theory of Woods *V. B.* **10.** 790.] on the mode of action of antibacterial substances which are chemically related to essential metabolites has been shown to have general application.—J. Keppie.

Mallmann, W. L., Botwright, W. E., & Churchill, E. S. (1941). **The Selective Bacteriostatic Effect of Slow Oxidizing Agents.**—*J. infect. Dis.* **69.** 215–219.

A comparison of the growth of typical members of the Gram-positive and Gram-negative groups of bacteria on nutrient agar and dextrose agar plates, containing potassium dichromate or sodium azide in concentrations ranging from 1 : 2,500 to 1 : 60,000, demonstrated that these slow oxidizing agents exerted a bacteriostatic effect on Gram-negative bacteria in dilutions which did not affect the growth of Gram-positive bacteria. The Gram-positive cocci, particularly streptococci, grew better than the Gram-positive spore-bearers in the presence of either agent. The addition of dextrose to the medium increased the activity of both oxidizing agents to the same degree.—R. O. Muir.

McCalla, T. M. (1941). **The Reaction of Certain Stains with Bacteria.**—*Stain Tech.* **16.** 27–32.

Suspensions of *Staphylococcus aureus*, a spore-forming bacillus, and three strains of *Bacterium coli*, obtained from salt agar cultures and killed by heating at 100°C. for 3–5 min., were saturated with adsorbed magnesium and hydrogen cations at specific concentrations by adding sufficiently dilute solutions of $MgSO_4$ and HCl respectively to the washed cells. Admixture with measured quantities of standardized basic stains, such as methylene blue, crystal violet, and basic fuchsin resulted in the adsorption of the basic stain with the release of the magnesium or hydrogen cations, thus indicating that a stain is adsorbed at the same position as inorganic cations. Basic stains decreased while acid stains increased the pH value of a bacterial suspension saturated with hydrogen cations and, from the increase in acidity obtained by displacing hydrogen cations with a basic stain, there appeared to be a maximum exchange value.—R. O. Muir.

DISEASES CAUSED BY PROTOZOAN PARASITES

Bourgeois, E. (1941). Zur Frage der Pathogenität der Trypanosoma Theileri. [**Question of Pathogenicity of *T. theileri***].—*Schweiz. Arch. Tierheilk.* **83.** 467–469.

The finding is recorded in the Canton of Lucerne, Switzerland, of *T. theileri* in smears from the uterus, spleen, and liver of a cow which had died two weeks after calving. The animal was in good condition, and

died suddenly, the autopsy revealing petechial haemorrhages on the mucous and serous membranes, subcutaneous tissue, and heart muscle, with haemorrhagic inflammation of the intestinal tract. Attention is drawn to two similar cases described in Switzerland by WYSSMANN, in which a *T. theileri* infection was also detected.—U. F. RICHARDSON.

HORNBY, H. E. (1941). **Immunization against Bovine Trypanosomiasis.**—*Trans. R. Soc. trop. Med. Hyg.* **35.** 165–176.

Further developments are recorded among the experimental cattle which SCHILLING, up to 1936, had attempted to immunize against trypanosomes by calf-hood infection, after a previous attempt to induce some resistance by inoculation with dead trypanosomes or minimal doses of living ones. The history of the herd is given from 1936–41, during which period H. was in charge of the experiment. In 1936 the herd contained 16 of Schilling's immunized animals, and five cows and three calves which had not been treated. Though the animals were in a tsetse area there appeared some doubt as to whether they had been regularly exposed to the attacks of tsetse fly.

In 1937 seven cattle died and blood smears from four of them showed the presence of *T. congolense*. A veterinary officer who investigated the disease recorded that the evidence which he had been able to collect pointed to the fact that the herd had not been exposed to frequent attacks by tsetse, and he suggested that mechanical transmission and inclement weather had broken down the partial immunity in these cattle conferred by previous infections. It is noted that earlier in 1937 two calves had been inoculated with trypanosomes. In 1938 the herd was moved to Kakoma and definitely exposed to daily attack by tsetse. Soon after arrival at Kakoma the incidence of positive blood smears became higher than ever. In January 1941 only six animals survived, and these were in poor condition. Of the animals treated prophylactically by Schilling only one was alive.

Methods of immunization of domestic stock against trypanosomiasis are discussed, and it is concluded that no method of immunization has yet been devised which will enable East African domestic stock to thrive in tsetse-fly belts.—U. F. RICHARDSON.

VAN DEN BRANDEN, M. (1941). Considérations au sujet du séro-diagnostic de la trypanosomiase. [**Serological Diagnosis of Trypanosomiasis**].—*Bull. Soc. Path. exot.* **34.** 81–84.

An antigen composed of *T. brucei* or *T. equiperdum* from the blood of a rat, washed by centrifugation, and finally suspended in a mixture of equal quantities of glycerin and physiological saline, gave positive complement fixation with the serum of rabbits infected with *T. brucei*. The same antigen gave negative results with the sera of g. pigs and white rats infected with *T. brucei* and with sera from rabbits free from trypanosome infection. No positive reactions were obtained when a nonspecific antigen, composed of an alcohol-cholesterol extract of ox heart, was used in place of the trypanosome extract. —U. F. RICHARDSON.

KRANEVELD, F. C., & DJAENOEDIN, R. (1941). Enkele waarnemingen over de postmortale diagnose van surra bij paarden. [**P.M. Diagnosis of Surra in Horses**].—*Ned.-ind. Bl. Diergeneesk.* **53.** 351–364. [English summary].

Using data compiled from the examination of 25 horses that had been allowed to die of surra, the authors determined how long after death *Trypanosoma evansi* could still be found microscopically or by g. pig inoculation, at atmospheric temperatures of 22°–30°C. Fresh smears, taken from the peripheral blood, failed to show the parasite in the majority of cases as early as 2½ hours after death, with time limits ranging from 1½ to 5½ hours. Stained peripheral blood smears failed to demonstrate the parasite, on the average, 3½ hours after death, with a total range of 1½ to 9½ hours.

Only in three instances did g. pig inoculation prove more helpful than the examination of stained slides. The latest time after death at which the former test still revealed the presence of trypanosomes did not exceed 2½–3½ hours.

P.M. examination of various tissues and fluids resulted in only four cases in the demonstration of parasites ½–1 hour after they had disappeared from the peripheral bloodstream. In these cases, the organisms survived longest in the heart blood. Because of this rapid disappearance of the trypanosomes from the blood and organs after death, and also in view of local difficulties of transport etc., prevailing in the Dutch East Indies, the authors conclude that a P.M. diagnosis of surra in horses can seldom be established with certainty. —M. LANDAU.

ROUBAUD, E., & PROVOST, A. (1941). Manifestations neurotropes d'une souche de *Trypanosoma gambiense* chez la souris. [**Neurotropism of a Strain of *T. gambiense* in the Mouse**].—*Bull. Soc. Path. exot.* **34.** 48–50.

A strain of *T. gambiense*, from a human case of sleeping sickness in the Cameroons, after maintenance in a laboratory in Europe for seven years had failed to develop any fixed characters in experimental animals, but caused very irregular infections in mice. One character of the mouse infections, inhibition of growth, has already been recorded, and the present paper describes three cases in which inoculated mice developed a chronic infection, lasting in one case over six months. Only rare trypanosomes were detected in the blood, and in one case subinoculation of blood into another animal failed to infect. The three animals developed posterior paralysis, and brain emulsion was infective on subinoculation. Brain sections showed perivascular infiltration similar to that described in human sleeping sickness. —U. F. RICHARDSON.

I. AUGUSTINE, D. L. (1941). **Observations Concerning the Filtration of Trypanosoma lewisi through Lymph Nodes.**—*J. infect. Dis.* **69.** 206–207.

II. AUGUSTINE, D. L. (1941). **The Behaviour of Trypanosoma lewisi during the Early Stage of the Incubation Period in the Rat.**—*Ibid.* 208–214.

I. After the intraperitoneal inoculation of rats with large numbers of trypanosomes, the parasites were found to have appeared in the thoracic duct and sternal lymph nodes within two hours. No evidence of a cellular reaction against living trypanosomes whilst in nodes or lymph channels was noted. It is pointed out that *Dirofilaria immitis* and *T. lewisi* experience no hindrance in passing through lymph nodes; this is in sharp contrast to the effectiveness of these nodes as a barrier to the passage of erythrocytes or streptococci.

II. The second paper records attempts to elucidate the development of *T. lewisi* in the mammalian host by a study of the behaviour of the trypanosomes after intraperitoneal injection of adult and young multiplying forms. It was found that trypanosomes might appear in the blood within 3 min. of intraperitoneal inoculation. When adult forms were injected no multiplication occurred in the peritoneum and multiplying forms were not found in the blood until two days after inoculation, and not in any number for four days. When young forms were injected multiplication continued in the peritoneal cavity and dividing forms occurred in the

blood from the start, though again there was a stationary period when trypanosomes were scanty. Since penetration of the peritoneum was continuing, it is argued that the absence of an increase in numbers in the peripheral blood during the first two days must indicate that some mortality was occurring. It is considered that *T. lewisi* is a parasite of the blood throughout its life, and that multiplication in the peritoneal cavity occurs only when young multiplying forms are injected. It is suggested that the prepatant period depends on the number of trypanosomes injected and also on their stage of development at the time of injection.—U. F. R.

PACKCHANIAN, A. (1940). **Experimental Production of Agglutinins for** *Trypanosoma cruzi.*—*Publ. Hlth Rep., Wash.* **55.** 2116–2124.

For the preparation of the *T. cruzi* antigen, trypanosomes were grown on blood-agar slants at room temperature (25°C.) for 1–3 weeks. When sufficient growth was obtained, the growths were freed and suspended in Tyrode's solution, coarse particles were removed by low speed centrifugation, and the trypanosomes were then washed three or four times in Tyrode's solution from which they were removed by centrifuging at high speed (about 3,200 r.p.m.). The organisms were finally suspended in Tyrode's solution so that the density of the suspension was about the same as that of a 48-hour growth of *B. typhosus* in broth, and contained about 2 million trypanosomes per ml.

For the immunization of animals the organisms were killed by adding 0·04% formalin, and the suspension was inoculated in doses of 1 ml. every 2–3 days until 7 or 9 injections had been given. After the agglutination titre had reached about 1 : 1,000, 18–24 inoculations were given of living *T. cruzi* suspensions, at intervals of 3–7 days. All the immunized animals produced specific antigens, the aggln. titre rising gradually, and in the case of rabbits reaching 1 : 262,144. The culture antigen was agglutinated by the sera of infected animals in dilutions of 1 : 256–1 : 1,024, but with the sera of animals infected with *T. evansi* the maximum aggln. titre was 1 : 32. The Californian strain of *T. cruzi* cultivated from bugs agglutinated with anti-trypanosome sera of the Panama strain at very high dilutions.
—U. F. RICHARDSON.

SIMITCH, T. (1938). *Entamoeba equibuccalis*, parasite de la bouche du cheval et de l'âne. [*E. equibuccalis* **n.sp., of the Mouth of the Horse and Donkey**].—*Riv. Parassit.* **2.** 183–187. [In French : English, French, German and Italian summaries].

S. describes amoebae which were found in the mouths of 16 out of 24 mares and three out of four donkeys at a breeding station at Skoplje, Southern Serbia. The strains from horses and donkeys were cross infective and morphologically indistinguishable. They were distinct from *E. gingivalis* of man, but very similar to *E. canibuccalis* [see *V. B.* **9.** 306.]. They were not, however, infective for dogs, nor was the dog species infective for horses. *E. equibuccalis* is non-pathogenic, infected animals showing neither pyorrhoea nor gingivitis.—E. S.

SIMITCH, T. (1939). *Tricomonas equibuccalis* n.sp. parasite de la bouche du cheval et de l'âne. [*T. equibuccalis* **n.sp., Parasite of the Mouth of the Horse and the Donkey**].—*Riv. Parassit.* **3.** 23–26. [In French : English, German and Italian summaries].

A trichomonad, as well as an amoeba [see preceding abst.], was isolated from the mouths of seven of 22 mares and two of four donkeys examined. Primary cultures of the trichomonad were obtained, but subcultures died out. This parasite did not exhibit amoeboid movement, and on this as well as on morphological grounds it could be differentiated from *T. elongata* and *T. canibuccalis*, recorded from the mouths of man and dog respectively. The organism could be experimentally transferred to the mouth of the horse and the ass, but not to cattle, sheep, and goats. [There is no mention of pathogenic action.]—M. L. BINGHAM.

I. ROBERTSON, M. (1941). **Agglutination Reactions of Certain Trichomonads in Sera Obtained from Immunised Rabbits, with particular Reference to** *Trichomonas foetus.*—*J. Path. Bact.* **53.** 391–402.

II. KERR, W. R., & ROBERTSON, M. (1941). **An Investigation into the Infection of Cows with Trichomonas Foetus by Means of the Agglutination Reaction.**—*Vet. J.* **97.** 351–365.

III. SWANGARD, W. M. (1941). **A Further Note on Diagnosis and Treatment of Bovine Trichomonas Infection.**—*J. Amer. vet. med. Ass.* **99.** 404–406.

I. For the work recorded in this article strains of *T. foetus* and other trichomonads were grown in culture. Some slight degree of contamination of *T. foetus* cultures occurred, but it is claimed that this did not disturb the result. Rabbits were immunized by the intravenous inoculation of washed cultures. Results were read after diluting the serum with descending concentrations of Locke's fluid and mixing it with an equal quantity of a test suspension of trichomonads suspended in trypsin broth and Locke's fluid, containing 100 organisms per cu.mm. Diluted serum and test suspension were mixed in a test tube, and then poured into small petri dishes and incubated for 1–2 hours.

The sera of many mammals contain agglutinins for trichomonads, but immune sera agglutinate in very much higher dilutions. In the highest concentrations of homologous immune serum, agglutination was extremely poor, but the organisms were wholly or partially immobilized and had a shrunken appearance. This pre-agglutination zone is followed by one in which motility is gradually suspended, the cells becoming arranged in rows in an echelon figure. With greater dilutions the trichomonads stuck together in round clumps with motile flagella waving at the periphery. With still greater dilutions the round clumps became less compact, and free motile organisms were present in increasing numbers. In the highest dilutions there were delicate rosettes of motile organisms lightly held together by the flagella. The positive endpoint in experiments was chosen as that at which the suspension could be described as dispersed, but contained numerous solid clumps.

The results of tests with immune sera showed a close relationship between two strains of *T. foetus* and *Eutrichomastix colubrorum*, whilst the immune bodies provoked by *T. columbae* and a species of *Herpetomonas* had very little effect on the *T. foetus* group. Heating for one hour at 100°C. was ineffective in destroying or altering the antigen, but heating at 100°C. for two hours caused a marked difference in the antigenic value.

II. The results are recorded of the examination of 165 cattle for *T. foetus* infection by the agglutination test as described in I. Mixtures of diluted serum and test suspension after being incubated were placed at room temperature, the first reading being made after 4–5 hours and the second, if desired, after 22–24 hours. All sera were heated to 56°C. for 15–20 min. A normal serum was included in each test and it was an advantage to include a known positive serum. As all normal cattle sera contain agglutinins for the organisms, the titre of the unknown serum must be evaluated in the light of the normal serum of the day.

The cattle examined were divided into three groups :— (1) 45 animals with normal histories ; (2) 25 animals

with histories of abortion or sterility and with a positive blood reaction, and (3) 95 animals with a history of abortion or sterility, or from herds in which abortion or sterility had occurred. Of the 25 positives, trichomonads were seen by competent observers in nine cases. A positive blood titre for *Trichomonas* was not found in any animal with a perfectly normal history or in virgin heifers. Animals infected with *Corynebacterium* or *Brucella abortus* did not show a raised titre for *T. foetus*. There was a clear connexion between positive blood titre and uncomplicated infection with *T. foetus*, but it was not definitely shown that absence of positive titre implies absence of infection. Abortion was associated with positive blood titre in 13 out of the 25 animals.

It is suggested that the test is valuable in throwing light on the state of infection in groups of animals, and that in practice it may be considered that, if one animal with a definitely positive reaction is found in a herd, it is an indication of a serious trichomonad infection, whether the organism can be found or not.

III. Emphasis is laid on the importance of treating bulls for trichomonad infection to prevent their remaining a danger to other cattle. *T. foetus* does not inhabit the urogenital tract but subsists in the superficial layers of the stratified squamous epithelium of the preputial mucosa. Treatment under epidural or paravertebral anaesthesia is simple, it being recommended that acriflavine salve should be used at a strength of 0·4%. An instrument is described for collecting specimens for examination from either bulls or cows. It consists of a metal tube, through which runs a wire carrying a brush.—U. F. Richardson.

I. McNeil, E., & Hinshaw, W. R. (1941). **Experimental Infection of Chicks with *Hexamita meleagridis*.**—*Cornell Vet.* **31.** 345–350.

II. Hinshaw, W. R. (1941). **Carriers of Hexamita Meleagridis.**—*Amer. J. vet. Res.* **2.** 453–458.

I. The authors have already shown that chicks can be infected with *H. meleagridis*. The experiments now described are concerned with maximum survival time of the infection in chickens, the most certain method of setting up artificial infection, increase of virulence by serial passages, and the possibility of chicks becoming infected from contact with infected turkey poults, and *vice versa*. *H. meleagridis* was found in the bursa of Fabricius and caecal tonsils of chickens for 22 weeks when the birds received the initial artificial infection before they were seven days old. The best method of infecting birds was found to be by injection *per cloacam*. No symptoms of infection with catarrhal enteritis were obtained in chicks by serial passages. Healthy chicks in contact with infected poults became infected and, conversely, healthy poults acquired infections by contact with infected chicks. The latter must, therefore, be regarded as possible carriers of *H. meleagridis*.

II. The principal sources of *H. meleagridis* are turkeys which survive an infection, and consideration is here given to the incidence of the organism in adult turkeys which had survived acute outbreaks, and in other birds and animals found near ranches where severe outbreaks had occurred. A high incidence of infection in adult turkeys showed that the breeding stock is the most important source of infection. No evidence of infection with *H. meleagridis* was obtained from examinations of chickens, pigeons, ducks, guinea hens, pea fowls, and some wild birds and reptiles from these areas. A species of *Hexamita*, transmissible to poults, was recovered from quail and chickens and cross-infection experiments indicated that these birds, as well as ducks, are possible carriers of the species.—C. Horton Smith.

Jacobi, L. (1940). Zur Biologie und Pathologie des Plasmodium Gallinaceum (Brumpt). **[Biology and Pathology of Fowl Malaria].**—*Arch. exp. Path. Pharmak.* **196.** 623–643.

When a fowl was inoculated intramuscularly with blood from an infected fowl, parasites were observed in the blood within a few minutes. After intravenous injection of smaller doses, parasites also immediately appeared in the blood and continued to develop. More parasites, however, continued their development if they were injected when they were nearing schizogony. There appeared to be no definite cyclic development as parasites were found in various stages in blood examinations made every two hours. A well established immunity to superinfection was observed in chronically infected birds. Birds which exhibit no symptoms have been found to carry parasites for as long as 18 months, and it was shown that 0·05 ml. of their blood would infect fresh birds. Heavily parasitized citrated blood remained infective for four days at laboratory temperature, but there was a gradual death of parasites during these days. Plasma from citrated blood ceased to be infective after 24 hours, but remained infective if blood from a clean bird was added to it. From this it must be concluded that survival is not due to the protection afforded by the host cell.—C. Horton Smith.

Hewitt, R. (1939). **Experimental Erythroblastosis in Canaries and its Effect on Infections with *Plasmodium cathemerium*.**—*Amer. J. Hyg.* Sect. C. **29.** 135–148.

In experiments on 53 canaries it was found that if the number of young red blood corpuscles in the peripheral blood was increased before the host was inoculated with *P. cathemerium*, phenylhydrazine hydrochloride being used to cause this effect, the number of parasites in the blood was very high.

Terzian, L. A. (1941). **Studies on *Plasmodium lophurae*, a Malarial Parasite in Fowls. II. Pathology and the Effects of Experimental Conditions.**—*Amer. J. Hyg.* Sect. C. **33.** 33–53. [For part I, see *V. B.* **11.** 437].

Chickens infected with *P. lophurae* show pathological changes similar to those associated with other avian malaria parasites studied in canaries. Quantitative evidence is given of the degree of anaemia, haemoglobinaemia, reticulocytosis, and erythrocyte volume change in various infections. When even low parasite numbers are present chickens have severe anaemia; this, and reticulocytosis, are greatest following the peak of parasite numbers. Destruction of erythrocytes is roughly parallel to the number of parasites, but regeneration of them takes place quickly and count values are usually restored to normal on the fifth day following the disappearance of the parasites from the circulating blood. T. finds that truer pictures of the parasite population are obtained on the basis of organisms per cu. mm. rather than on the number of parasites per 10,000 erythrocytes. No evident relationship between spleen size and magnitude of parasitaemia is observed. Increased weight of birds results in increased resistance. An experiment to determine whether serum, which might contain immune bodies, would influence the course of infection when injected together with parasitized erythrocytes, showed that it did not affect the degree of parasitism or its virulence. T. finds that, contrary to the results obtained by Hewitt [see preceding abst.] phenylhydrazine does not influence the virulence of *P. lophurae*, and he thinks that the reason is related to the fact that merozoites are almost exclusively confined to the erythrocytes.—C. Horton Smith.

Wagner, O. (1941). Fortschritte der Piroplasmosen-Forschung. **[Advances in Research on Piroplas-**

mosis].—*Tierärztl. Rdsch.* **47.** 233–237.

W. accepts the view of REICHENOW that there is no sexual multiplication in Babesidae or Theileridae, and no schizogony in the latter family. The differences between the two families are ascribed to the multiplication of the former in the erythrocytes, and of the latter in the lymphocytes. [There is nothing original in the article, and W. uncritically accepts Reichenow's findings, which are interesting but unconvincing.]

—U. F. RICHARDSON.

QUEVEDO, J. M., & QUEVEDO, J. M., Jr. (1941). Babesielosis. **[Babesiellosis].**—*Rev. Med. vet., B. Aires.* **23.** 333–339.

Several cases of piroplasmosis are described in which the animals were infected with *Babesiella*. The disease is acute and attacks young animals and even unweaned calves. The organism is described as ill defined bodies in the blood corpuscles, which stain uniformly, no chromatic body being distinct as in *Babesia*. Even at the height of fever the organisms are not numerous, and in mixed infections by *Babesia* and *Babesiella* the latter may be overlooked or considered as atypical forms of *Babesia*.—MILLER WATSON.

HOWELL, D. E., STILES, G. W., & MOE, L. H. (1941). **The Hereditary Transmission of Anaplasmosis by *Dermacentor Andersoni* Stiles.**—*Amer. J. vet. Res.* **2.** 165–166.

Female *D. andersoni* were collected from an early case of bovine anaplasmosis in Wyoming and sent to Oklahoma. One engorged female tick commenced to lay eggs, and the larvae hatching from these were placed on a cow which had been purchased " several weeks previously ". This animal developed clinical anaplasmosis, showed anaplasma bodies in the blood, and has since been used as a carrier in transmission work. The other ticks collected were allowed to complete engorgement on a calf in Oklahoma, but the larvae raised from their eggs failed to transmit anaplasmosis.

[Since the incubation period of anaplasmosis may be several months, and no information is given as to the antecedents of the cow which developed infection, the claim of the proof of hereditary transmission in ticks is unconvincing.]—U. F. RICHARDSON.

RAVEN, C. (1941). **Canine Leptospirosis in Pennsylvania.**—*J. infect. Dis.* **69.** 131–137.

A good review on the recent literature on canine leptospirosis is given, pointing out the differences in the clinical symptoms between *L. canicola* and *L. icterohaemorrhagiae* infections in dogs. It is noted that dogs can only carry and excrete leptospira for a limited time, and that antibodies appear in the blood about the tenth day, reach their maximum in 1–2 months, and then decline to a lower level (1 : 300) in about 2–3 years.

Investigations were undertaken to ascertain the prevalence of the two infections at one centre in Pennsylvania and at another in Philadelphia, evidence of infection being judged on the results of agglutination tests. For aggln.-lysis tests it was necessary to work with heavy cultures and a clear medium, the most suitable medium being considered to be Schüffner's modification of Verwoort's medium (a highly buffered peptone serum). Although growth was good in clear rabbit serum it was better in serum containing some haemoglobin. No difference was found between fresh and inactivated serum. Since the blood of dogs tends to haemolyse early, the sera were separated as soon as possible, inactivated, and stored in a refrigerator. 38·1% of the sera examined contained immune bodies for leptospira. The incidence of infection was higher in dogs over two years old, and higher in males than in females. Of the positive sera 26 were ascribed to *L. canicola*, and nine to *L. icterohaemorrhagiae*.—U. F. R.

STEFANOPOULO, G. J., & CHEVÉ, J. (1941). Culture de *Leptospira icterohemorrhagiae* en tissus embryonnaires de poulet. **[Cultivation of *L. icterohaemorrhagiae* in Chick-Embryo Tissues].**—*Bull. Soc. Path. exot.* **34.** 15–17.

Cultivation of *L. icterohaemorrhagiae* was successfully carried out on a medium composed of either extract of equine blood clot or Tyrode's solution, to which was added brain tissue from chick embryos 12–15 days old. Cultures were incubated at 29°C. for 4–5 days, after which they remained viable at room temperature for several months. Five subcultures were made without alteration in the agglutination characters of the strain.

—U. F. RICHARDSON.

DISEASES CAUSED BY VIRUSES AND RICKETTSIA

HANSLIAN, A. (1939). Prubeh slintavky a kulhavky na kurímském školním závode zemedelském Vysoké školy zverolékarske v Brne v r. 1938. **[Course of an Outbreak of Foot and Mouth Disease].**—*Zverolék. Rozpravy.* **13.** 47–53.

A general paper containing nothing new.—O. SPIRMANN.

MAREŠ, J. (1939). Slintavka a kulhavka v zemi Moravskoslezské. **[Foot and Mouth Disease in Moravia-Silesia].**—*Zverolék. Obz.* **32.** 129–138.

M. described an outbreak of F. & M. disease which occurred in August, 1938 and which resulted in infection of 52% of the stock of the territory with a mortality of 2–3%. The country had been free from the disease for the previous ten years.

In 1938, the State began an eradication campaign by trying the different methods of active and passive immunization used in other countries. In districts where infection appeared, inoculation with immune serum reduced the severity of cases if given before the onset of pyrexia. The serum-virus method reduced the virulence of outbreaks. Active immunization with virus, followed in two days by inoculation of 50–80 ml. of serum, apparently produced favourable results, and the immunity conferred lasted about two months.

—O. SPIRMANN.

*PALLASKE, G. (1940). Weitere Untersuchungen über Skelettmuskelschäden im Verlaufe der Maul- und Klauenseuche. **[Further Observations on Skeletal Muscle Changes in Foot and Mouth Disease].**—*Tierärztl. Rdsch.* 319–322. [Abst. from abst. in *Zbl. Bakt. I.* (*Ref.*). **139.** 313].

This is the final part, with conclusions, of an article already abstracted [see *V. B.* **12.** 82]. From muscle lesions diplo-streptococci and/or " *pyogenes* " bacteria were isolated, but " fish-flesh " lesions were generally sterile. P. concludes that the F. & M. disease virus is undoubtedly the cause of the muscle lesions described. Unless there is secondary bacterial infection the animals are likely to recover.

HOBOHM, K. O. (1940). Die Anreicherung von Maul- und Klauenseuche-Virus aus infektiösem Serum durch Fällung mit Azeton und mit Ammoniumsulfat. **[Enrichment of Foot and Mouth Disease Virus from Infected Serum by Precipitation with Acetone and Ammonium Sulphate].**—*Zbl. Bakt. I.* (*Orig.*). **146.** 139–142.

F. & M. virus could be precipitated from virulent g. pig serum by the addition of an equal quantity of acetone (temp. of mixture –10°C.) or ammonium sulphate (½–¾ saturation). H. claims to have increased the titre

at least five times whilst at the same time reducing the protein concentration. [See also *V. B.* **8.** 85, and **7.** 470.]—JOHN FRANCIS.

WALDMANN, O., PYL, G., HOBOHM, K. O., & MÖHLMANN, H. (1941). **Die Entwicklung des Riemser Adsorbatimpfstoffes gegen Maul- und Klauenseuche und seine Herstellung. [Development of Riems Foot and Mouth Disease Adsorbate Vaccine and its Preparation].**—*Zbl. Bakt. I.* (*Orig.*). **148.** 1–15.

An account of the researches of many workers which led to the development of the Riems method of making F. & M. disease vaccine [cf. a similar article by PETERSEN —*V. B.* **12.** 19]. The steps in the research were briefly as follows. WILLSTÄTTER's research on enzymes and adsorbing substances, the work of SCHMIDT *et al.* (1) on the properties and uses of adsorbed toxins and viruses, and (2) on the successful immunization of g. pigs but not cattle against F. & M. disease by adsorbed virus subjected to a temperature of 25°C. for two days, and lastly the observation by WALDMANN *et al.* that the above vaccine could be made safe for cattle by the addition of formalin.

The Riems technique is described in detail for general scientific purposes, it is stated, to avoid controversy about priority etc. Italian workers have recently produced vaccines on similar lines.—J. E.

*LE ROUX, G. (1940). Essai sur la propriété immunigène du virus de la peste bovine, **[The Immunological Properties of Rinderpest Virus].**—*Ann. Inst. Pasteur.* **65.** 205–236. [Abst. from abst. in *Zbl. Bakt. I.* (*Ref.*). **139.** 333].

It was found that the immunizing value of various organs does not correspond with their virus content. In experiments with the tonsils, thymus, lymph nodes, haemolymph nodes, and Peyer's patches of infected calves, the tonsils had 1½–3 times the immunizing power of lymph nodes, the thymus very much less (⅓th or less), the haemolymph nodes about the same, and the Peyer's patches about one-sixth as much.

It appeared that immunizing power was linked with lymphoid tissue and, in conformity with this theory, it was found that older animals which possess relatively less lymphoid tissue were poorer sources of vaccine. Lymph-node cortex was much more potent than the medulla.

NAKAMURA, J., & GOTO, Y. (1941). **On the Experimental Infection with Rinderpest Virus in the Rabbit. IV. Complement-Fixation Reaction.**—*Jap. J. vet. Sci.* **3.** 263–286. [In Japanese : abst. from English summary]. [For part III, see *V. B.* **11.** 761].

Details are given of the preparation and treatment of tissue extracts and sera, etc., for use in complement-fixation tests of rabbits recovered from experimental infection with rinderpest virus. It was found that non-specific reactions with the rabbit sera could be avoided by storing it in an ice chest with 0·25% phenol and heating at 60°C. for 30 min. before use but that the serum, after heating, did not long retain its antibody. Hyperimmune cattle sera and normal calf sera were used unheated for control tests. Antibody was demonstrated in the sera of 60 out of 62 convalescent rabbits by testing samples before, and 14 days after, the passage of rabbit strain virus against infected and normal calf lymph node extracts. Further tests showed that antibody was active one month after virus inoculation and that it thereafter declined. Antibody was present in infected rabbits' blood at eight days after inoculation, while the blood retained its infectivity for at least six days longer. Further studies showed the distribution of antigen in the tissues of infected calves and rabbits and only tissues of the lymphatic system gave positive results. Control cross tests with heterologous antisera (virus and bacterial) supported the specificity of the above tests. The nature of the reactions is discussed. —C. V. WATKINS.

GEIGER, W. (1941). Schweinepest und Virusseuche der Schweine in Afrika. **[Swine Fever and East African Swine Fever in Africa].**—*Dtsch. tierärztl. Wschr.* **49.** 145–148.

A review and description of East African swine fever. —J. E.

EVELETH, D. F., SCHWARTE, L. H., & MILLEN, T. W. (1941). **Chemical Changes in the Blood of Swine Infected with Hog Cholera. II. The Serum Bases and Whole Blood Haemoglobin and Glutathion.**—*Vet. Med.* **36.** 510–513. [See also *V. B.* **10.** 175].

Nine pigs which for 40 days previously had received a standard ration of yellow maize, tankage, lucerne and soya bean meals, and cod liver oil (supplemented in five cases by 3% bone meal) were injected with 3 ml. each of a commercial S.F. virus preparation : one animal died on the sixth day and the remainder, all of which showed clinical symptoms, were killed on the tenth day. Determinations were made of the red blood corpuscles, haemoglobin, whole blood glutathione, and of serum Na, K, Ca, and Mg, both prior to infection and at two-day intervals after infection. The variations in the values after infection were mostly small or erratic, but there was a rise in serum K and a slight fall in serum Ca and Na. A single blood sugar determination, made on the tenth day, showed high values. The authors suggest that the findings may indicate a marked adrenal insufficiency.—ALASTAIR N. WORDEN.

BUENO, P. (1940). Alteraçoes cardiacas encontradas em casos de peste suina. **[Heart Changes in Swine Fever].**—*Arq. Inst. biol., S. Paulo.* **11.** 59–68. [English summary].

B. made investigations on 68 animals which had died of naturally occurring S.F. and on 28 animals infected experimentally. In almost every case there were macroscopic changes in the myocardium consisting of isolated or confluent yellowish areas associated with hyperaemia and petechiae in the muscle. These changes were always more noticeable in the papillary muscles of the left ventricle. Frequently there was considerable dilatation of the organ.

Histologically the changes were of two types, *viz*, degenerative and proliferative. In the first type cloudy swelling and disappearance of the striations occurred, and in some cases areas of necrobiosis were found in the papillary muscles. In the proliferative type there was an increase of fibroblasts and histiocytes in the interstitial tissue, often with the formation of bodies resembling the Aschoff bodies of human myocarditis ; in some cases there was considerable oedema.

In the 28 animals artificially infected and destroyed after a few days' illness, the cardiac changes were slight.

B. points out that such changes have been noted in the hearts of swine which had died suddenly from unknown causes, and suggests that the virus of S.F. may have been responsible.—MILLER WATSON.

MICHALKA, J. (1941). Beitrag zur histologischen Diagnose der ansteckenden Schweinelähmung. **[Histological Diagnosis of Porcine Encephalomyelitis].**—*Wien. tierärztl. Mschr.* **28.** 295–305.

W. reviews the problem of histological diagnosis from the basis of experience of 463 fresh cases and of 11 experimentally infected pigs. Work was done on 789 pig carcasses which were sent for examination and the

remainder (326) comprised material of value in the study of differential diagnosis.

The nature of the lesions of P.E. has been described by other workers (see *V. B.* **12.** 86 and 275]: M. confirms this and supplies some quantitative data. In cases considered to be P.E. the lumbar spinal cord, medulla oblongata, brain stem, cerebellum, and cerebellar meninges were affected in all cases, the hippocampus and olfactory lobes in 70%, the cerebral cortex and meninges in 60%, and the meninges, particularly the pia mater, in 10%. Characteristic changes were observed in 27 pigs which had been killed on the first day of illness, the spinal cord, medulla, and cerebellum being involved in every case. This observation is important for differentiation from swine fever, in which c.n.s. changes are not perceptible for at least ten days in natural cases. In subacute to chronic cases of P.E., the author observed regressive and progressive changes of the endothelial tissue (swelling and necrosis followed by proliferation), together with advancing degeneration of the ganglion cells, particularly of the ventral horns. Hyaline degeneration of the endothelium as seen in swine fever, was never seen in P.E.

Among the carcasses sent for examination there were 10 cases of swine fever, 25 of swine erysipelas, 7 of purulent serosa and joint inflammation, 4 of paratyphoid, 10 of a productive encephalomyelitis of doubtful causation, 1 of piglet influenza, 10 of non-purulent leptomeningitis, 12 of ascariasis, and 7 of miscellaneous origin: they were all sent under suspicion of P.E. and c.n.s. was histologically examined. In swine fever the changes described by other workers were verified: these are characterized by blood-vessel cuffing of equal intensity in the grey and white matter. In swine erysipelas there were haemorrhages on the pia mater as well as in the cord itself and the cord blood-vessels were congested. In purulent serosa and joint inflammation there was purulent meningitis and hyaline degeneration of the endothelium. In paratyphoid there was endangitis and endophlebitis with secondary meningitis. The ten cases of productive encephalomyelitis were of uncertain origin and were characterized by hypertrophy and hyperplasia of the endothelial and adventitia cells. The case of piglet influenza showed slight vascular infiltration and leptomeningitis. The cases of leptomeningitis showed no nerve tissue lesions. Five of the 12 cases of ascariasis, which showed nervous symptoms had a hyperaemia of the brain and/or spinal cord or meninges; the rest were normal.

M. concludes that it is impossible to give a certain diagnosis of P.E. as a result of histological examination of the c.n.s. alone. The circumstances of the cases and/or outbreaks must provisionally determine the diagnosis in the first instance; then confirmation is supplied or left undecided as a result of histological examination. For the latter it is particularly important to obtain the c.n.s. of pigs killed during the first three days of illness and the cerebral cortex, cerebellum and spinal cord should be supplied for examination. Rapid paraffin embedding and the haematoxylin-eosin staining method are recommended.—J. E.

FRAUCHIGER, E., & HOFMANN, W. (1941). Die epidemische Kinderlähmung und die Teschener Krankheit der Schweine. **[Comparison of Epidemic Poliomyelitis of Man and Porcine Encephalomyelitis].**—*Schweiz. med. Wschr.* **71.** 584-585.

An article written for medical practitioners to draw their attention to porcine encephalomyelitis, which the authors believe to exist in Switzerland. Poliomyelitis and P.E. are compared in a table. [The authors have suggested that poliomyelitis occurs in farm animals (see *V. B.* **10.** 675.), but they did not prove that their recorded cases were caused by the virus of human poliomyelitis. Two pig infections come into consideration in this respect—porcine encephalomyelitis and swineherds' disease, both of which affect the nervous system. The latter is considered to be a virus infection common to swine and man, but there are as yet no published cases of P.E. virus affecting man.]—J. E.

TYZZER, E. E., & SELLARDS, A. W. (1941). **The Pathology of Equine Encephalomyelitis in Young Chickens.**—*Amer. J. Hyg.* Sect. B. **33.** 69–81.

The report deals chiefly with the pathological changes found in young chickens experimentally infected with the Eastern type of E.E. virus.

Myocardial lesions were regularly produced. Occasionally extensive degeneration, and more frequently slight perivascular infiltrations, of the central nervous system were observed. In several chickens extensive degeneration of the liver occurred. The smooth muscle of the gizzard frequently presented foci of infiltration. Inoculated chickens frequently showed greatly distended hearts and pericardial or peritoneal effusion.

Chickens dying early showed extensive myocardial destruction, with the earliest response consisting largely of a great increase in cells of the mesenchymal type. These are at first phagocytic but later are concerned with scar tissue formation or in regeneration of heart muscle. Later the connective tissue response is overshadowed by infiltrating lymphoid or plasma cells or rounded mononuclears. The infiltration gradually becomes more and more localized and after the eighth day only sharply circumscribed collections of lymphoid cells are to be found.

Attention was given to the question of cell inclusion bodies in the tissues of various species experimentally infected. The authors could see no special significance in such structures as have been described as inclusion bodies.—F. D. ASPLIN.

WHEELER, J. A. (1941). **Western Equine Encephalomyelitis Occurring among Human Beings in Kansas during the Summer of 1940.**—*J. Amer. med. Ass.* **117.** 1972–1973.

The serum of 50% of an unstated number of human beings with encephalitis was found to neutralize Western E.E. virus.—J. E.

*REMLINGER, P., & BAILLY, J. (1940). La dessication n'atténue pas le virus rabique, elle le conserve (premier mémoire). **[Desiccation Does not Attenuate Rabies Virus, but Conserves it].**—*Ann. Inst. Pasteur.* **65.** 130–145. [Abst. from abst. in *Zbl. Bakt. I.* (*Ref.*). **139.** 310].

A record of experiments showing that complete desiccation is associated with long viability and that incomplete drying results in the virus dying out, probably owing to autolysis or proteolysis by an enzyme which acts in the presence of moisture. Completely dried virus was resistant to high temperature (over 100°C.).

CARNEIRO, V. (1940). A cobaia no estudio experimental da doença e Aujeszky. **[Aujeszky's Disease in G. Pigs].**—*Arq. Inst. biol., S. Paulo.* **11.** 97–106. [English summary].

From his experimental work, C. concludes that the g. pig is a useful laboratory animal for the study of Aujeszky's disease. The degree of susceptibility varies greatly when the infection is carried out by the subcutaneous route, at least when American strains of the virus are used. When the intramuscular route is used, however, a high susceptibility is constantly noted, the M.L.D. being approximately 1 ml. of a 1:2,500 emulsion. The g. pig also proved suitable for the

estimation of antibodies in sera from infected animals. —Miller Watson.

Verlinde, J. D. (1940). Eenige epidemiologische gegevens over de vreesziekte en encephalitis bij honden. **[Epidemiology of Canine Hysteria and Encephalitis in Dogs].**—*Tijdschr. Diergeneesk.* **67.** 525–534. [Abst. from abst. in *Zbl. Bakt. I.* (*Ref.*). **139.** 342].

In the opinion of the author there is a virus-induced encephalitis of dogs which requires an additional stimulus, such as auto-intoxication, to produce the disease. He considers that local, seasonal and inherited factors also have an influence in this respect. He suggests that canine hysteria is a symptom of encephalitis. [Verlinde is the only investigator who has differentiated this encephalitis. Evidence in support of the theory must be awaited. (See also *V. B.* **12.** 151.)—Ed.]

Geiger, W. (1941). Getrennte oder gleichzeitige Virus-Serumimpfung bei Hundestaupe? **[Separate or Simultaneous Virus and Serum Inoculation in Dog Distemper].**—*Dtsch. tierärztl. Wschr.* **49.** 535–537.

By three series of 15 experiments on numerous dogs G. determined that immunity against distemper can be produced by serum and virus given either simultaneously or at an interval, the virus being given up to two days before the serum. It was found inadvisable to give the serum first. In cases where easy access can be had to the dog on two or three successive days, G. recommends the separate method, otherwise the simultaneous method can be considered satisfactory.—J. E.

Stein, C. D., & Osteen, O. L. (1941). **Studies on Immunization in Equine Infectious Anemia.**—*Amer. J. vet. Res.* **2.** 344–349.

Immunity tests were carried out on horses treated with the following tissue vaccines prepared from cases of E.I.A. :–(a) 10% brain suspension treated with 0·4% formalin for 30 days at a temperature of 5°C., injected in one dose of 100 ml. ; (b) the same vaccine, given in two doses of 100 ml. and in six doses of 100 ml. ; (c) formolized 10% suspension of horse spleen given in three doses of 100 ml. ; (d) 50 ml. of a 33·3% brain suspension treated with 1% chloroform for 90 days at 5°C. ; (e) spleen suspension treated with 0·1% phenol and 0·05% crystal violet for 72 days at 5°C. ; (f) defibrinated blood treated in the same way as for (e) but incubated at 37·5°C. for 14 days before refrigeration.

None of these vaccines conferred immunity on horses. The first vaccine apparently prolonged the incubation period of the disease to 47 days, as compared with nine days in the control horse.

Vaccines prepared by treating virulent blood plasma from infected horses with chemicals (phenol, ether and phenol, formalin, crystal violet and phenol, and phenyl mercury acetate and phenol) for at least 30 days at 5°C., failed to immunize horses, as did also blood plasma inactivated by heating at 57°–60°C. for one hour. The concentrated pseudoglobulin and serum-albumin fractions of virulent plasma were found to contain no active virus, but when injected in doses of 50 ml. they did not establish immunity.

Virus treated with 0·4% formalin for 13 days, or 1% chloroform for 60 days remained fully virulent, although the incubation period in inoculated horses was prolonged. Desiccation for two weeks to nine months failed to attenuate the virus.

An attempt to produce an immune serum by hyperimmunization of a carrier failed, owing to the death from E.I.A. of the hyperimmunized animal.—I. W. B.

Studer, R. (1941). Bösartige Zitzenkrankung verursacht durch Pockenlympheübertragung. **[Severe Cow Pox of the Teats Caused by the Transmission of Pox Lymph].**—*Schweiz. Arch. Tierheilk.* **83.** 131–134.

An account of the transmission by a newly vaccinated boy of pox to the teats of 10 out of a herd of 33 cows on Alpine pasture. Three other persons who acted as milkers developed pox lesions on the hand and axillary lymph node swelling. It was considered that they helped to spread the cow pox and became infected simultaneously. The diagnosis was confirmed in the laboratory.—J. E.

Hester, H. R., Boley, L. E., & Graham, R. (1941). **Studies on Cowpox. I. An Outbreak of Natural Cowpox and its Relation to Vaccinia.**—*Cornell Vet.* **31.** 360–378.

An outbreak of disease clinically indistinguishable from cow pox is described in a herd of dairy cows. The disease could not be experimentally transmitted and no protection against vaccinia virus could be demonstrated in recovered animals. A filtrable agent from natural lesion material could not be propagated on embryonic chorio-allantoic membrane. Twenty-one clinical cases of "udder pox" developed following the application of vaccinia, and natural lesion material from two typically affected animals was employed in transmission experiments with negative results. Three animals that failed to react to vaccinia developed natural "udder pox". The frequent occurrence of pox or pox-like disease in the cattle, together with the development of lesions on the hands of some of the attendants, suggests the possibility of a virus disease which has become modified through biological adaption.—S. J. G.

Bennison, J. C. (1942). **Equine Variola : Oral Form or Equine Contagious Pustular Stomatitis.**—*J. R. Army vet. Cps.* **13.** 48–53.

Two outbreaks of contagious pustular stomatitis in army horses are described, one of which occurred in England and the other in Palestine. In both instances the classical stages of papule, vesicle and ulcer were seen, the lesions being confined to the mouth. At first attempts were made to control the disease by isolation, but this method was unsuccessful. As the condition was relatively benign it was considered better, therefore, to encourage transmission as the disease spread quickly and subsided equally rapidly in self-contained units. —R. E. Glover.

Bierbaum, K., & Weitzenberg, R. (1941). Weitere Untersuchungen über Hühner- und Taubenpocken-Virus. **[Further Research on Fowl and Pigeon Pox Virus].**—*Arch. wiss. prakt. Tierheilk.* **76.** 360–362.

Bollinger bodies can only be found after careful searching in the skin reaction produced in fowls by the inoculation of pigeon pox virus (P.P.V.). When P.P.V. was passaged in the fowl the size of the local lesion increased slightly, but generalization never occurred. There was also very little increase in the number of Bollinger bodies. A small experiment indicated that passage of P.P.V. in the fowl tended to reduce the resultant immunity against fowl-pox virus (F.P.V.).

When F.P.V. is passaged in the pigeon its virulence for this species increases and its virulence for the fowl decreases. With sufficiently prolonged passage, F.P.V. can be completely changed into P.P.V., and it cannot be reconverted to F.P.V.—John Francis.

Maitland, H. B., & Laing, A. W. (1941). **On the Function of Tissue Cells in Media used for Growing Vaccinia Virus.**—*J. Path. Bact.* **53.** 419–430.

Experiments are described which show that certain properties of culture medium are required to initiate the growth of vaccine virus, but that they are not

necessarily the same as those which are needed for multiplication in the later stages. The medium used was Tyrode's solution with minced rabbit kidney. In fresh medium an increase in virus was detectable after from 4–7 days, depending on the weight of minced kidney: on the other hand, uninoculated medium incubated for five days failed to initiate the growth of the virus although it still provided suitable conditions for virus which had already commenced to propagate. Thus both the factors were demonstrable, the one required to start growth and the one which is revealed by increase in virus at a time when the medium would no longer initiate growth.

Experiments on the rate of utilization of oxygen (Warburg technique) failed to show any relation between the degree of tissue respiration and growth-initiating properties. Disorganization of the cells produced by weak KCN or by treatment of the tissues by water destroyed the virus stimulus.—R. E. Glover.

Smith, E. C., Horgan, E. S., & Ali Haseeb, M. (1941). **Experiments in Connexion with an Attempt to Produce a Neurotropic Strain of Vaccinia Virus in Sheep.**—*J. Hyg., Camb.* **41.** 509–520.

Attempts to infect sheep by the intracerebral route using a strain of vaccine which had been adapted to the skin, were unsuccessful. The dermotropic sheep strain was readily established, however, in rabbit testicular tissue from which it was successfully converted into a rabbit or mouse neurovaccine. The mouse-adapted strain proved to be of high potency with an incubation period of three days: moreover, it retained its dermotropic affinities, producing typical vesicles in rabbits and in children. It failed to produce the inflammatory reaction commonly associated with the classical rabbit neurovaccine strains. In the rabbit, the virus became "fixed" with an incubation period of 4–5 days. At first it failed to produce paralysis, but acquired this characteristic after serial passage.

It was noted that the intracerebral inoculation of sheep with mouse neurovaccine failed to produce frank symptoms, but the animals were subsequently immune. —R. E. Glover.

Chambers, L. A., & Henle, W. (1941). **Precipitation of Active Influenza A Virus from Extra-Embryonic Fluids by Protamine.**—*Proc. Soc. exp. Biol., N.Y.* **48.** 481–483.

It is known that infected extra-embryonic fluids are rich in virus. They can be partially purified by dialysis which removes the uric acid, but non-dialysable substances such as egg protein remain in relatively large amounts; the active substance can, however, be precipitated by the addition of protamine, and when a basic protein, such as spermine, is added to the infected extra-embryonic fluid a precipitate appears immediately. Fluids from normal eggs yield little or no precipitate. Although, when this precipitate is washed and suspended, the resultant suspension contains only 0·4% of the original nitrogen, it has approximately the same titre and antigenic value as the original material. It is stated that the active agent in this preparation is distinctly different from material obtained by the sedimentation of infected lungs. It is relatively simple in structure, consisting largely of ribonucleoprotein. It is suggested that protamine precipitation of the active agent of influenza from infected egg fluids constitutes a step towards isolation and identification of the virus.—John Francis.

Zellat, J., & Henle, W. (1941). **Further Studies in Passive Protection against the Virus of Influenza by the Intranasal Route.**—*J. Immunol.* **42.** 239–249.

The intranasal instillation of anti-influenza A or B serum protected mice against the subsequent inoculation of the respective homologous, but not heterologous, virus. Occasional irregular results were prevented by using a spray technique for the instillation of serum.

The passive immunization experiments showed encouraging results in mice, but ferrets were not equally well protected. Fever and nasal symptoms were not prevented, but pulmonary involvement was markedly reduced. Possible reasons for such differences are discussed.—John Francis.

Sulkin, S. E., Smith, J. E., & Douglass, D. D. (1941). **Experimental Study of an Institutional Outbreak of Epidemic Influenza.**—*J. infect. Dis.* **69.** 278–284.

A filtrable agent, identified as human type influenza A virus, was recovered from throat washings of acute cases of human influenza by direct intranasal inoculation of mice and by instillation on the allantoic membrane of the egg. The strain was found to be immunologically related to type A by cross-vaccination experiments in mice, by serum neutralization tests, and by complement fixation.—R. E. Glover.

Komorov, A., & Grasovsky, Y. S. (1941). **Notes on Specific Infectious Respiratory Disease Affecting Baby Chicks (Infectious Bronchitis).**—*Vet. J.* **97.** 407–410.

Two outbreaks of a disease apparently identical with infectious bronchitis of chicks are described from Palestine. The history indicated the probability of egg transmission.—F. D. Asplin.

Jungherr, E., & Minard, E. L. (1942). **The Present Status of Avian Encephalomyelitis.**—*J. Amer. vet. med. Ass.* **100.** 38–46.

This is mainly a survey, the authors' observations confirming previous findings. The tissues and faeces of adult survivors contain a filtrable factor which produces microscopic lesions in the central nervous system indistinguishable from those found in spontaneous cases of avian encephalomyelitis.—F. D. Asplin.

Yanamura, H. Y., & Meyer, K. F. (1941). **Studies on the Virus of Psittacosis Cultivated in vitro.**—*J. infect. Dis.* **68.** 1–15.

Twelve strains of psittacosis virus have been successfully cultivated in Li and Rivers' fluid medium. The "Maine" strain isolated from an American parakeet has been maintained by cultivation for 2½ years through 252 serial passages without loss of virulence. A modification of the solid agar medium developed by Zinsser, Wei, and FitzPatrick proved satisfactory and gave a greater yield of virus than fluid cultures for the same amount of tissue. The virus was readily propagated in the yolk sac of the chick embryo.

In a fluid medium the ratio of tissue to fluid is the all important factor, whilst the surface to volume ratio is relatively unimportant. Psittacosis virus was found to grow equally well in sealed or unsealed flasks. Virus multiplication in culture is intimately associated with tissue survival. Psittacosis virus possessed no peculiar affinity for any certain type of cells, but was observed to invade and multiply in the most readily available cells. Certain salts are essential growth requirements. The fluid culture medium was used to titrate a virus suspension and this was found to be as sensitive as the mouse method. The virus culture has provided an excellent source of material for the production of vaccines and antigens.

Observations on the developmental stages of the psittacosis virus support the findings of previous investigators. The name *Microbacterium multiforme psittacosis* has priority rights over the designation L.C.L.

[Levinthal-Cole-Lillie] bodies for the elementary bodies aetiologically responsible for psittacosis.
—F. D. Asplin.

*Beeuwkes, H. (1940). Ueber eine Viruskrankheit des Meerschweinchens. [**A Virus Disease of G. Pigs**]. —*Schweiz. Z. allg. Path. Bakt.* **3.** 65–74. [Abst. from abst. in *Zbl. Bakt. I.* (*Ref.*). **139.** 344].
A disease appeared in g. pigs inoculated with human dermatitis material; it was believed, however, that the infection was unrelated to the inoculum, but was latent in the g. pigs. The active disease was characterized by fever, peritoneal haemorrhage, reddening of the lymph nodes, and low mortality. The causal agent is filtrable, is killed at 65°C. and is not pathogenic for rabbits, white mice, or monkeys.

Kobe, K. (1941). Ueber Virusforschung. [**Research on Viruses**].—*Berl. Münch.. tierärztl. Wschr.* June 13th. 285–288.
A useful discussion on modern methods of virus research and the nature of viruses.—John Francis.

Cox, H. R. (1941). **Cultivation of Rickettsiae of the Rocky Mountain Spotted Fever, Typhus and Q Fever Groups in the Embryonic Tissues of Developing Chicks.**—*Science.* **94.** 399–403.
The method of maintaining strains of rickettsia by inoculating the yolks of fertile eggs is described. The rickettsia of Rocky Mountain fever, endemic typhus, European typhus, *fièvre boutonneuse*, Brazilian spotted fever, Australian and American "Q" fever, South African tick-bite fever, and other strains have been maintained by this method. When establishing strains there is a period of adaptation before maximal growth which is not obtained for 4–6 passages. Strains once established can be maintained indefinitely. G. pigs inoculated with recently established yolk-sac strains usually exhibit a more severe reaction than those inoculated from animal infections. After strains have been maintained through a number of yolk-sac passages a rather constant time for the killing of the chick embryo is established, and in g. pigs inoculated with material from such strains the severity of the infection is decreased, and with high dilutions no clinical manifestation may be produced, but there may be an immunizing effect.

For the preparation of vaccines, the pooled embryonic tissues are harvested from all the eggs of the same transfer, although the yolk sac is the most important constituent. The material is diluted to a 12% suspension in saline containing 0·5% phenol and 0·3% formalin. The suspension is centrifuged and the supernatant liquid containing the lipoids and some proteins is poured off and the sediment again suspended in saline containing phenol and formalin. This is kept at room temperature for 6–7 days, during which time the greater part of the protein is precipitated, then diluted with 5 vol. of sterile saline and kept at 36°F. for 7 days. The material is then centrifuged and the resulting fluid constitutes the vaccine.

Typhus and spotted fever vaccines made in this way have proved immunizing for g. pigs, have given apparently satisfactory results in human beings, and do not appear to lead to any serious sensitization.

One instance is recorded in which a strain of rickettsia maintained in yolk sacs eventually produced inapparent disease and satisfactory immunization in g. pigs.
—U. F. Richardson.

SPONTANEOUS AND TRANSMISSIBLE NEOPLASMS AND LEUCAEMIAS [INCLUDING FOWL PARALYSIS]

Shemin, D., Sproul, E. E., & Jobling, J. W. (1940). **Studies of the Transmissible Agent of the Rous Chicken Sarcoma I. Precipitation with Basic Proteins.**—*J. exp. Med.* **72.** 697–705.
The viscosity of Rous sarcoma I extracts is due to a polysaccharide which can be hydrolysed by the enzyme which Meyer (1937) isolated from pneumococci and by the enzyme which Chain & Duthie [*V. B.* **11.** 382.] isolated from the testis. Hydrolysed extracts remain infective and can be filtered through Berkefeld V filters without appreciable loss of the infective agent.

The Rous sarcoma agent was precipitated from hydrolysed filtrates by the use of basic proteins, namely papain and thymus histone. Papain-agent complex was soluble in 3% NaCl solution and could be purified. Histone-agent complex was very insoluble and did not lend itself to purification.

Inoculation experiments showed the precipitate to be infective, whilst the supernatant fluid was not.

The components of the papain-agent complex could be separated in a Tiselius electrophoresis cell. Papain moved towards the cathode and components originating from the turnover moved towards the anode.—F. D. A.

Kidd, J. G. (1941). **The Detection of a "Masked" Virus (the Shope Papilloma Virus) by Means of Immunization. Results of Immunization with Mixtures Containing Virus and Antibody.**—*J. exp. Med.* **74.** 321–344.
It is known that the virus of domestic rabbit papillomas (Shope) is often, and of cottontail papillomas occasionally, "masked", *i.e.* inoculation of the material does not produce infection. The presence of virus can, however, be inferred by the steadily increasing amounts of antibody in the blood of infected rabbits. Further, it has been shown that suspensions of inactive papilloma tissue may produce specific viral antibodies when they are inoculated intraperitoneally into rabbits. All the evidence suggests that there is less virus present in the papillomas of domestic rabbits than in those of cottontail rabbits. The present experiments were undertaken to ascertain why some suspensions of domestic rabbit papillomas even fail to produce antibody following inoculation.

Antiviral antibody is almost invariably present in greater or lesser amounts in virus induced papillomas and the quantity in cottontail cancer may be so great that extracts will neutralize added virus. It has been shown [*V. B.* **11.** 249.] that the amount of antibody in tumours depends on the quantity of circulating antibody and on the local vascular conditions.

From the results of his experiments, K. concluded that the amount of extravasated antibody was often sufficient to render extracts of domestic rabbit papillomas non-antigenic; and sometimes, when present in excess, its passive transfer conferred resistance to reinfection with the virus. Only positive immunization findings can be interpreted with certainty; negative results provide no decisive evidence as to whether "masked" virus is or is not present in the injected material, unless the amount of extravasated antibody is known. These findings may have a bearing on the negative results of immunization experiments with extracts of the cancers derived from the natural papillomas of cottontails.
—John Francis.

MARINE, D., & ROSEN, S. H. (1941). **Sex Hormones and Lymphomatosis in Fowls.**—*Proc. Soc. exp. Biol., N.Y.* **47.** 61–62.

Of 41 White Leghorn male castrates divided into three groups, 12 birds each received 1 mg. oestradiol dipropionate weekly, 12 received testosterone dipropionate in variable amounts twice weekly, and 17 served as controls. Seven of the oestrogen group, four of the androgen group, and four of the controls died of lymphomatosis. It is suggested that the occurrence of lymphomatosis in 58% of the oestrogen group compared to 23% of the control group, may indicate that the induced sex hormone imbalance was a factor in stimulating or activating the agent responsible for overgrowth of lymphoblastic tissue.—R. ALLCROFT.

BELLER, K. (1940). Stand und Ziel der Erforschung der ansteckenden Hühnerlähmung. **[Position and Aim of Research into Infectious Fowl Paralysis].**—*Berl. Münch. tierärztl. Wschr.* Aug. 9th. 381–383.

B. comments on the lack of indications of progress in work on fowl paralysis reported to the Seventh World Poultry Congress held in America in 1939. He notes, however, that the number of members who denied the infectious nature of the disease was smaller than at the previous conference in 1936. He quotes in full a German programme of research similar to that of the new research institute opened at East Lansing, at the time of the 1939 Congress.

In an experiment then just completed in Germany, intercerebral and intramuscular inoculation of infected material failed to produce symptoms of F.P. B. believes this result to be only a further proof of the importance of individual susceptibility, and believes that only positive transmission experiments should be considered to be of value.

The danger of the spread of the disease through various State breeding and exchange schemes is emphasized. It appears, however, that the number of cases developing on farms and smallholdings which have received chicks from infected premises is surprisingly small. Close observation of six different farms which had received chicks from heavily infected premises revealed no cases of F.P. in the first year, but in the second year, some of the second generation developed typical paralysis or ocular changes. The disease can evidently be present in latent form, and the possibility of carrier birds, showing no symptoms, but capable of transmitting the disease, further complicates the problem of prevention and control.—A. F. RUSSELL.

ALLEN, F. M. (1941). **Combinations of Lead, Arsenic, and other Chemicals with Experimental Asphyxia of Tumors.**—*J. Lab. clin. Med.* **26.** 1120–1128.

A study was made of the killing effect of various substances on tumours in rats. The influence of ligation, to produce local asphyxia, on the efficacy of these drugs was examined; their individual influence and their influence in various combinations in sensitizing tumour tissue to the asphyxiating effect of ligation were also investigated. Although As, and to a lesser extent Pb, had an action similar to ligation, combination of the two methods of treatment yielded only slightly better tumour-killing results, and these were overshadowed by the increase in local and systemic dangers. Injections of colloidal Au, Ag, Fe, Mn, Cu, Sb, S, and Se alone and in various combinations with ligation at different times relative to the time of injection, failed to cure any tumours but instead increased the dangers of ligation so that ligations could not be maintained for the usual durations. No improvements followed single or repeated local injections of eosin, methylene blue or gentian violet.

Streptococcus toxin, in various combinations with ligation, showed neither a curative tendency nor a selective toxicity for tumour as compared with normal tissue.

Increasing or decreasing cell respiration by local or systemic injections of O_2 or CO combined with ligation of the tumour yielded negative results.

It was felt that the efficacy of As should be emphasized and attention was called to the influence of locality of the tumour and differences in tumour sensitivity on response to treatment.—J. DUCKWORTH.

IMMUNITY

*BELLER, K. (1940). Reichweite und Technik der Serodiagnostik der Tuberkulose. **[Limits and Technique of Serodiagnosis of TB.].**—*Klin. Wschr.* **19.** 1133–1135. [Abst. from abst. in *Tierärztl. Rdsch.* **47.** 519].

A discussion on the limitations of serological reactions for the diagnosis of TB. B. states that allergic tests cannot be replaced by serological tests.

HEHLE, E. (1939). Die Flockungsreaktion nach Meinicke-Sachweh zur Diagnose der Tularämie. **[The Meinicke-Sachweh Flocculation Test Applied to Tularaemia].**—*Wien. tierärztl. Mschr.* **27.** 381–382.

An experiment was carried out to ascertain the value of Sachweh's modification of Meinicke's flocculation test for the diagnosis of tularaemia, the tularaemia extract being prepared by Fleischhauer's method. The serum of persons not affected with tularaemia showed no flocculation. Different antigens and different samples of sera were used to test the specificity of the reaction and 38 samples which gave a positive reaction to the agglutination test gave a positive Meinicke-Sachweh flocculation reaction, unless the serum was contaminated or haemolytic. The reaction was specific for tularaemia. While the test cannot replace the aggln. test, H. believes that it can be usefully employed to confirm the diagnosis of tularaemia.—ANN F. RUSSELL.

*WEIS, J. (1940). Zur biologischen Diagnose des Abortus Bang. **[Diagnosis of Bovine Brucellosis in Switzerland].**—*Inaug. Diss., Berne.* [Abst. from abst. in *Tierärztl. Rdsch.* **47.** 459].

In Switzerland, where there is a cattle population of almost two million, about 60,000 abortions occur annually. Four serological tests for brucellosis were made simultaneously in 487 cattle. The blood-serum slow agglutination test was the most accurate; the fresh milk rapid aggln. test gave very similar results but failed to detect recently infected cases, while the blood rapid aggln. test and a modification proposed by DAVID were both too delicate and yielded an excessively high number of positive results.—M. LANDAU.

I. ROBERTS, E. C., & JONES, L. R. (1941). **Detection of Minute Amounts of Serum Antibody by Agglutination of Antigen Coated Bacterial Cells.**—*Proc. Soc. exp. Biol., N.Y.* **47.** 11–14.

II. ROBERTS, E. C., & JONES, L. R. (1941). **Agglutination of Encephalitis Virus-Coated-Bacterial Cells by Virus Antisera.**—*Ibid.* 75–76.

I. The method described involves the coating of cells of a suspension of *Serratia marcescens* with s erum antigen and observing the agglutination of these cells after addition of the animal serum to be tested. Details are given of the preparation of the antigen-coated bacterial

cells. A comparison was made of antibody titres, as determined by the conventional precipitation test using the antigen dilution method and this new technique involving bacterial agglutination (B.A.) of antigen coated cells at various time intervals after passive and active immunization of rabbits with horse serum. The results show that the B.A. method serves to detect antibody much earlier and is much more sensitive than the precipitation test. It may not be more sensitive than the collodion particle agglutinative method of CANNON & MARSHALL [*V. B.* **11.** 380; see also WEIR —*V. B.* **12.** 93.], but it is claimed to be more convenient and the bacteria employed exhibit greater suspension stability than collodion particles. It is suggested that this method may be applied to immunological problems such as allergic states, virus diseases, and other conditions where very small amounts of circulating antibody may be involved.

II. A preliminary report is given of the use of the sensitive antigen-antibody reaction described in I for the detection of antibodies in the blood of man and animals against the virus of St. Louis encephalitis. Agglutination tests were made with the sera of (a) human beings convalescent from encephalitis, (b) normal individuals, and (c) rabbits immunized against the virus. Although agglutination was observed in all cases in group (a), the titres of the sera were not in complete agreement with their virus neutralizing capacities and further observations are necessary to establish this relationship. In group (b) consisting of 18 supposedly normal individuals a reaction in dilutions of 1 : 8 or higher was obtained in 80% of the cases. These results were correlated in most instances with the presence of neutralizing antibodies, although the neutralizing capacities were not in complete agreement with the B.A. titres. Group (c) antisera gave B.A. reactions in dilutions of 1 : 512; the specific nature of the reaction was established.—R. ALLCROFT.

DURAN-REYNALS, F. (1940). **The Flocculation of Tissue Extract by Normal and Immune Sera of Fowls and of other Animals.**—*Yale J. Biol. Med.* **12.** 361–398. [Abst. from reprint in *Stud. Rockefeller Inst. med. Res.* **115.** 195–229. (1940)].

The blood sera of fowls and some other birds have the property of flocculating at low temperatures (2°–4°C.) saline and alcoholic extracts of normal and malignant tissues of many animals. The ability of sera to flocculate such extracts is demonstrable in chicks of about 26 days of age, a time at which normal antibodies are present. The property is subject to seasonal variation, being strongest during the autumn months. Antigens of good antigenic power given in adequate amounts increase the flocculating ability of chicken sera. The curve of flocculating ability raised by immunization with specific antigen closely parallels that of specific antibody. Absorption of sera by specific precipitinogen removed the tissue-flocculating factor, whilst absorption of sera with tissue extract removed only part of specific antibody. Tissue extract injected into a previously immunized fowl elicited no recall of specific antibody.

The factor responsible for flocculation of tissue extracts is probably a globulin and appears to be the result or by-product of antibody formation rather than an independent antibody.

Positive tissue-flocculating sera were Kahn positive; negative sera were both Wassermann and Kahn negative.

—F. D. ASPLIN.

RIGDON, R. H. (1941). **Localization and Concentration of Staphylococcus Antitoxin in Areas of Rabbit's Skin.**—*J. Lab. clin. Med.* **27.** 37–40.

When staphylococcus antitoxin is injected intravenously into rabbits and a shaved area of skin is treated simultaneously with xylol, an area of hyperaemia and oedema, which may last five days, is produced while the antibody tends to become concentrated at the focus of inflammation. In rabbits which have not received antitoxin, an intradermal injection of staphylococcus toxin induces zones of necrosis which are approximately the same size in xylol-treated and in normal areas of the skin. There is a marked difference, however, when the antiserum is given: in this case, following the injection of the toxin, there is marked inhibition of dermal necrosis in the xylol-treated areas as compared with normal skin. An interval of about two hours is necessary before sufficient antitoxin accumulates in the local inflammatory areas to neutralize the toxin completely.—R. E. GLOVER.

CUNDIFF, R. J., & MORGAN, H. R. (1941). **The Inhibition of the Bactericidal Power of Human and Animal Sera by Antigenic Substances Obtained from Organisms of the Typhoid-Salmonella Group.**—*J. Immunol.* **42.** 361–367.

Smooth, motile strains of *Salmonella typhi, S. enteritidis* and *S. paratyphi B* of established serological and biochemical identity were cultured in a synthetic medium containing only ingredients removable by dialysis and extracts were prepared by repeated precipitation with alcohol from aqueous solutions. The bactericidal titre of five typhoid antisera, two prepared in rabbits against whole bacteria and purified antigen respectively, and three in human beings against the somatic antigen, was determined by mixing a constant amount of complement and a constant number of bacilli with graded dilutions of antiserum. The dilution of antiserum used in the inhibitive tests was such that bactericidal action was complete in the absence of antigen. The results of one experiment with each antiserum, confirmed by 12 other determinations, showed that in suitable quantities the protein-free antigens of the three species studied inhibited the capacity of the various antisera to destroy *S. typhi*. Whereas a certain amount of *S. typhi* antigen produced the same degree of inhibition as ten times the amount of the two other salmonella extracts, much larger amounts of a similar extract from Friedländer's bacillus type A exerted no antibactericidal effect.—R. O. MUIR.

WRIGHT, A. E. (1942). **On the Need for Abandoning much in Immunology that has been regarded as Assured.**—*Proc. R. Soc. Med.* **35.** 163–186.

This lecture is divided into two parts. The first consists of practical suggestions for the improvement of the technique of phagocytic counts. W. advises the use of defibrinated blood in order to eliminate blood platelets, centrifugation of the phagocytic mixture to bring leucocytes and microbes into more effective contact, and the elimination of all unphagocytosed microbes from the mixture by amputating, after centrifugation, the upper end of the capillary tube. He believes that counts in which bacteria have been agglutinated by the serum used, should be discarded, and discusses the method of distinguishing between (a) opsonic action exerted by serum on microbes, (b) a phago-incitor stimulin action exerted by the serum on the leucocytes, and (c) the phago-incitor action exerted on the leucocytes by the microbes.

The second part is a review of the progress of immunology since the end of the last century, and the experiments which led to the revision of the older theories are described. There are discussions on the question as to whether bacterial vaccines operate specifically or non-specifically, and new data on the roles of leucocytes and serum in bacterial infections.—ISOBEL W. BURTON.

VETUKHOV, M. A. (1939). Sistematicheski povyshat' ustoĭchivost' zhivotnykh k zabolevaniyam. **[Increasing the Resistance of Animals to Disease].**—*Sovyet. Vet.* No. 10–11. pp. 20–22.

The author suggests that by increasing the mineral supply in the diet of animals from an early age, a process which he speaks of as " mineralisation ", an increase in the resistance to such diseases as tuberculosis and brucellosis could be achieved. He discusses this point of view and also advocates the use of knowledge on hereditary factors for building up herds possessing an increased inherited resistance to such diseases. [No indication is given by the author that the experimental animals were on diets inadequate in minerals and vitamins before increasing the mineral supply. There appears to be no evidence that increase in resistance to infective diseases is associated with ingestion of excess minerals.—Ed.].—A. MOLDAWSKY.

I. ABERNETHY, T. J., & AVERY, O. T. (1941). **The Occurrence during Acute Infections of a Protein not Normally Present in the Blood. I. Distribution of the Reactive Protein in Patients' Sera and the Effect of Calcium on the Flocculation Reaction with C Polysaccharide of Pneumococcus.**—*J. exp. Med.* **73.** 173–182.

II. MACLEOD, C. M., & AVERY, O. T. (1941). **The Occurrence During Acute Infections of a Protein not Normally Present in the Blood. II. Isolation and Properties of the Reactive Protein. III. Immunological Properties of the C-reactive Protein and its Differentiation from Normal Blood Proteins.**—*Ibid.* 183–190 and 191–200.

I. The serum obtained from patients during the acute stage of certain infectious diseases, notably lobar pneumonia, contains a substance, probably a protein, which yields a precipitate in the presence of a dilute solution of the C polysaccharide of *Pneumococcus*. This substance was found to be labile at temperatures above 65°C. Specimens containing it were fractionated by precipitation with ammonium sulphate. The precipitating titre of the albumin fraction was comparable to that of whole serum, while the globulin fraction was totally inactive. Complete removal of calcium from the blood caused inhibition of the reaction, but this was restored on the addition of subnormal quantities of calcium.

II. The reactive protein was restricted to that fraction of the serum albumin precipitated between 50% and 75% saturation with ammonium sulphate. Practically all of the protein was precipitated when the active albumin fraction was dialysed against tapwater. After further purification, the substance was chemically analysed and found to contain 13·97% of nitrogen, and 0·05% of phosphorus.

When the alcohol-ether soluble lipids were removed from acute phase serum, the reactive protein became soluble in tap-water, and not precipitable by calcium, but it was still precipitable by C polysaccharide.

III. The precipitins formed in rabbit serum by reactive protein were highly specific and reacted weakly or not at all with the proteins normally present in human serum. Immunological specificity was demonstrated also by the complement-fixation test. Antiserum to human C-reactive protein reacted specifically with the serum of monkeys with artificial pneumococcus infection. Immunological reactions revealed the presence of amounts of the protein too small to give a visible precipitate in tests with the C polysaccharide.

—ISOBEL W. BURTON.

WEISS, C. (1942). **Studies on Inflammation. IV. Behavior of Cellular Proteinases in Experimental Tuberculosis of Rabbits.**—*Arch. Path.* **33.** 182–187.

The concentrations of cathepsins of the spleen and liver of rabbits immunized with tubercle bacilli of low virulence, were markedly decreased after injection of a virulent bovine strain ; the changes in concentration in the kidneys and lungs were negligible. Reinoculation with a low virulence strain caused no significant alteration in the concentration of cathepsin in any of the tissues examined (spleen, liver, kidney, lung). *In vitro* experiments showed that neither human nor bovine tuberculin, purified protein derivative, nor the carbohydrate extracted from bovine tubercle bacilli had any effect on the leucocytic or tissue cathepsins of normal, allergic, or reinfected rabbits ; only Anderson's phosphatide A-3 prepared from human or bovine virulent tubercle bacilli markedly depressed catheptic activity. It is suggested that this may be due to the inhibitory action of the phosphatide which may be liberated during the destruction of the tubercle bacilli.—R. A.

KENTON, H. B. (1941). **The Arthus Phenomenon in the Rat.**—*J. infect. Dis.* **69.** 238–242.

1% crystalline egg albumin and sheep serum were used as antigens in attempts to produce a state of local hypersensitivity in the white rat by repeated subcutaneous injections at different points, by repeated intracutaneous injections at the same point, by the insertion of a large amount of concentrated antigen into the subcutaneous tissue, by repeated intraperitoneal injections of large amounts of antigen, and by intracutaneous and intraperitoneal injections of immune and hyperimmune serum prepared in rabbits against the antigen. Eighty-three rats were used for these experiments. The white rat was shown to respond to repeated antigenic stimuli with only feeble antibody production and the Arthus phenomenon could not be demonstrated in the skin of actively immunized rats. Constant occurrence of the phenomenon upon injection of the specific antigen into the skin of white rats passively immunized with large amounts of potent antiserum indicated that the tissues of the rat will react typically in the presence of a sufficient concentration of antigen and antibody.—R. O. MUIR.

HENLE, W., CHAMBERS, L. A., & GROUPÉ, V. (1941). **The Serological Specificity of Particulate Components Derived from Various Normal Mammalian Organs.**—*J. exp. Med.* **74.** 495–510.

Saline suspensions of different organs from various animals were filtered through Mandler candles and the filtrates centrifuged at 20,000–25,000 r.p.m. for 20 min. By this method suspensions of small particles of approximately 0·1–0·3μ in diameter were obtained which were employed for the production of organ-particle antisera in the rabbit, such sera being used in agglutination and complement-fixation studies.

The most specific results were obtained by the aggln. test, as particles from all the organs examined revealed a fairly high degree of organ specificity. Some cross-reactions were observed, but absorption of the sera with heterologous particles left the organ-specific agglutinins. The c.-f. results resembled those reported by other workers for whole organ suspensions. More cross-reactions were encountered than with the agglutination test, but the reaction was considerably sharpened by the employment of the absorption of sera technique.

In addition to organ-specific differentiation, most particles exhibited species specificity (kidney, lung, testicle, and heart muscle), but brain particles reacted equally well with antisera of both homologous and heterologous species.—R. E. GLOVER.

BAILEY, G. H., & RAFFEL, S. (1941). **Organ and Species Specificity of Broths made from Ox Muscle, Lung,**

and Small Intestine, in Passive Anaphylaxis.—*Amer. J. Hyg.* Sect. B. **34.** 8–20.

G. pigs were passively sensitized by injection of an antiserum prepared in rabbits immunized with a heat-killed, sedimented culture of *Pasteurella boviseptica*, grown in broth made from ox skeletal muscle. Anaphylactic shock was induced in them by autoclaved extracts of striated muscle of ox, horse, and dog, but not by extracts of the muscles of 11 other vertebrate species. In those cases in which the g. pig survived, an injection of homologous broth was given, to test for possible antigenic relationships, by specific desensitization.

In the same way, g. pigs were passively sensitized with antisera for broth made from lungs and small intestine of the ox. Tests showed that there was organ specificity with these two antisera, except for mutual cross-reactions between them.

Experiments were carried out to determine the physical and chemical properties of the anaphylactogen in the broth made from ox skeletal muscle. It was found to be highly thermostable, and soluble in cold 99% alcohol. Results indicated that it was either a secondary proteose or a peptone, resulting from the hydrolysis of a specific tissue protein.—Isobel W. Burton.

Feldberg, W. (1941). **Histamine and Anaphylaxis. Development of the Histamine Theory of Anaphylaxis.**—*Ann. Rev. Physiol.* **3.** 671–694.

Evidence for and against the histamine theory of anaphylaxis is reviewed. The development of the histamine theory and possible mechanisms for the release of histamine from the tissues are discussed. It is pointed out that different organs are concerned in the liberation of histamine in anaphylaxis in the different species; thus the liver is the organ chiefly involved in dogs while in g. pigs the lung may be regarded as the shock organ since the dominant symptoms of acute anaphylaxis in this species is broncho-constriction. In rabbits blood histamine decreases during anaphylactic shock, probably indicating a decrease in leucocytes in the circulating blood. In other animals, *viz*, the horse, sheep, goat, and calf no increase in blood histamine has been observed. The concentration of histamine in the blood, however, indicates only approximately the amounts actually released, and the proportion reaching the blood appears to vary greatly in different species. Since specific organs are the main site of the antigen-antibody reaction in the different species, the symptomatology will be determined by the effects on these organs and therefore differences between the symptomatology of the response to injected histamine and anaphylaxis do not necessarily disprove the histamine theory. It is also pointed out that the histamine theory does not pretend to explain all the manifestations of the antigen-antibody reaction as being due to histamine effects. The responses of smooth muscle preparations to histamine and antigen are described. Discrepancies in histamine action and the release of a muscle stimulant substance other than histamine are discussed. The use of histaminase in the relief of certain allergic conditions is briefly dealt with, indicating that the evidence is still inconclusive.—R. Allcroft.

PARASITES IN RELATION TO DISEASE [ARTHROPODS]

Staples, R. R. (1941). **Anti-Tsetse Clearing and Land Use.**—*E. Afr. agric. J.* **7.** 48–50.

Certain effects of bush clearing in semi-arid deciduous or thorny thicket zones are discussed. With the clearing of bush, perennial grasses tend to increase, with the result that, after grazing, there is less run-off and soil erosion from cleared plots than from thicket plots. According to Uganda workers, soil fertility appears to be primarily dependent on "crumb structure", a condition apparently brought about by root contact with the soil particles. It appears that grass ley may be equal or even superior to bush ley in the restoration of soil fertility following cultivation. From experimental data obtained at Mpwapwa it seems that the control of woody vegetation may increase the stock-carrying capacity of secondary thicket grazing land no less than four times, and the food produced is better distributed over a longer period of the year.

Mpwapwa work tends to show that where vegetation is allowed to grow undisturbed, a climax, woodland type develops, which is capable of consuming the whole of the rainfall normally penetrating the soil. On the other hand when vegetation was controlled, the rainfall was found to percolate more deeply into the soil, and the only proof obtained of rainfall contributing towards ground water was under a grass community.—U. F. R.

Hornby, H. E. (1941). **Pasture Management in Relation to Tsetse Reclamation.**—*E. Afr. agric. J.* **7.** 51–55.

It is suggested that the bulk of grasslands of East Africa are seral communities successional to woodland, and that most are maintained as grassland by fire. The effects of grazing on these grasslands depend on its intensity: if grazing be light enough to permit occasional fires the browsing of shrubs may help to stabilize the grassland stage, but if the grazing is heavy enough to prevent fires then the setback to the grasses is greater than that to the shrubs and the succession tends to advance to woodland devoid of ground herbage, resulting in a lowering of carrying capacity and exposure to erosion.

The line beyond which stock numbers do more harm than good is easily passed, and tsetse encroachment under such conditions cannot be considered an unmitigated evil. If the threat of tsetse is necessary to inaugurate better methods of stock management, then this threat is a good thing. Pasture should be considered as a crop which, like any other crop, requires labour for its production.

Satisfactory reclamation is only brought about through a programme of sustained effort which starts with clearing and is continued through a long range of farming operations until the whole area is involved in a system of agricultural development which does not allow tsetse to exist. It is not always realized that unless these flies are kept in close check, so that cattle can be kept, it is impossible for soil fertility to be economically maintained.

A description is given of the anti-tsetse measures taken at the Mpwapwa laboratory. Here the local hillside woodland grazing was abandoned, and a clearing of about 800 acres was cut out of thicket and *Combretum* woodland and planted with grasses. Persistent slashing of coppice and suckers is necessary for maintenance but an almost worthless jungle has been transformed into a valuable farm.

Rules are given for concentration schemes where human sleeping sickness exists, the most important of which appear to be that the proportion of periphery to the area of clearing should be reduced to a minimum, that stock keeping should be encouraged for the nutrition of the people and the maintenance of soil fertility, and that the perimeter of the clearing should be sharply defined.—U. F. Richardson.

MITSCHERLICH, E. (1941). Hühnerstallungen und die Bekämpfung der Hühnerzecken in Deutsch-Südwest- und Südafrika. **[Fowl Houses and the Control of Fowl Ticks in South-West and South Africa].**—*Dtsch. tierärztl. Wschr.* **49.** 346–348.

In South and South-West Africa, fowls are attacked by the ticks *Argas persicus* and *Ornithodoros moubata* which can cause death by sucking blood. These ticks also transmit *Aegyptianella pullorum* and *Spirochaeta gallinarum*. They are very resistant to insecticides, and even petroleum [? kerosene] is not considered satisfactory for their destruction. The only methods of tick destruction recommended are the use of the blowlamp and sulphur dioxide fumigation. In the case of *A. persicus* the larvae will live on the birds for ten days, so that in addition to the disinfection of the fowl house, the fowls must be shut up in special quarantine houses for ten days to allow all larvae to drop off. In the case of *O. moubata* the larvae do not feed and, as the nymphal and adult ticks do not remain on the birds during the daytime, one day in the quarantine houses is sufficient.

It is considered that the essentials of a satisfactory hen house are that it should be free from crevices, and capable of disinfection by flaming. Parts which cannot be flamed should be easily detachable for fumigation. The incorporation of tick traps in the walls is stated to be of no value, since *A. persicus*, the more serious pest, does not climb down the walls to reach the fowls, but falls on them from the roof. As far as possible all parts of the house should be well lit, so that dark corners are not available for ticks to retire to, and ventilation should be adequate. Two types of houses are described, one permanent and the other movable.—U. F. RICHARDSON.

PARASITES IN RELATION TO DISEASE [HELMINTHS]

WILHELM, O. (1941). Contribución al estudio de la hidatidosis en Chile. La equinococosis en Concepción. **[Echinococcosis in Chile].**—*Rev. Chil. Hig. med. Prev.* **3.** 281–289.

Hydatid disease in human beings is common in Chile. During the period 1915–19 the average incidence of echinococcosis in bovine animals killed in the municipal abattoir of Santiago was 16·87% and in swine 10·95%. During the first three months of 1940 the average incidence in the abattoir at Concepción was 4·83% for sheep, 34·22% for cattle, and 15·7% for swine. W. emphasizes the need for prophylactic measures.—M. W.

HAIGHT, C., & ALEXANDER, J. (1940). **Hydatid Cysts of the Lung.**—*Arch. intern. Med.* **65.** 510–523.

Two cases of echinococcus disease of the lungs are reported. Of the 46 human cases which are known to have occurred in North America only five are known to have been born there. A report from the Bureau of Animal Industry stated that during the fiscal year ended June 30th 1936, 1,513 cattle livers and 21 calf livers were condemned on account of echinococcus infestation, and that swine echinococcosis was not rare in certain sections of the U.S.A., particularly in the south.—R. A.

LEONARD, A. B., & LEONARD, A. E. (1941). **The Intestinal Phase of the Resistance of Rabbits to the Larvae of** *Taenia pisiformis*.—*J. Parasit.* **27.** 375–378.

Normal and passively immunized rabbits were infected with artificially hatched larvae of *T. pisiformis* by direct injection into the mesenteric vein. The average numbers of cysticercal lesions found in the livers on the seventh day after infection were not significantly different in the two groups. In the control groups, however, which were infected *per os*, the average number of lesions per liver was rather lower in the normal group and greatly reduced in the immunized group. It is concluded that the resistance of immunized rabbits to infection with *T. pisiformis* larvae exists in two well defined phases, an "early" intestinal phase which destroys many larvae soon after ingestion, and a "late" parenteral phase which disposes of most of the larvae which succeed in passing the intestinal barrier [see also *V. B.* **6.** 659].—M. L. BINGHAM.

I. MAUSS, E. A. (1941). **The Serum Fraction with which Anti-Trichinella (*Trichinella spiralis*) Antibody is Associated.**—*Amer. J. Hyg.* Sect. D. **34.** 73–80.

II. MAUSS, E. A. (1941). **Occurrence of Forssman Heterogenetic Antigen in the Nematode, *Trichinella spiralis*.**—*J. Immunol.* **42.** 71–77.

III. OLIVER-GONZÁLEZ, J. (1941). **The Dual Antibody Basis of Acquired Immunity in Trichinosis.**—*J. infect. Dis.* **69.** 254–270.

I. The four criteria used to determine the serum fraction with which antibodies to *T. spiralis* are associated were:—fixation of complement by anti-trichina serum in combination with *T. spiralis* antigen, circumlarval precipitate formation [see *V. B.* **11.** 775.], reduction in infectivity of larvae after exposure to anti-trichina serum, and protection of mice inoculated with immune serum against infection with trichina larvae. The serum and globulin fractions were separated by salt fractionation and by ultracentrifugation. The results of these tests indicate that anti-trichina antibody, as in the case of bacterial antibodies, is associated with the globulin fractions of immune serum, and that in the case of precipitation by salt fractionation, the antibody content is higher at the euglobulin than at the pseudoglobulin level.

II. M. demonstrated that *T. spiralis* possesses the heterogenetic antigen described by FORSSMAN. The tests showed:—firstly, that the serum of rabbits previously fed with trichina larvae was able to lyse sheep erythrocytes; secondly, that the haemolysin was absorbable by kidney emulsion prepared from g. pigs, and thirdly, that injection of the trichinous rabbit serum provoked marked reactions in g. pigs and in a chicken, whose tissues were rich in heterogenetic antigen. Observations to determine whether the presence of a high haemolytic titre would alter the course of *T. spiralis* infection in rabbits were not conclusive, but it is suggested that the reaction to the intradermal test for diagnosis of trichinosis might be modified in such animals.

III. Further experiments [see *V. B.* **11.** 775.] have demonstrated the presence of two types of antibody in the serum of rabbits infected with *T. spiralis*. The "anti-adult" type caused precipitates at the mouth, anus, and vulva, and sometimes the death of the adult worms *in vitro*. The titre, as indicated by the *in vitro* effects on adults, is demonstrable about the 15th day after infection, increases until the 25th day, remains constant for about ten days and then falls to zero by the 50th day. It appears about five days after superinfection and reaches its highest level during repeated superinfections. The antibody partially protects rats against the intestinal stages of infection. The activity of hyperimmune serum is very slightly, if at all, absorbed by dried powdered adults, and its precipitin titre when such worms are used as antigens is negative throughout initial infection and superinfection. The "antilarval" type of antibody causes oral, but no anal, precipitates, and sometimes the death of the larvae *in vitro*. The titre, as indicated both by its *in vitro* effect on larvae and by precipitin test, appears 30 days after infection, is

highest 45–60 days after infection, and is not quite as high during superinfection. This type fails to protect rats against the intestinal phase of infection, is absorbed by dried larvae, is produced in rabbits artificially immunized with dried larvae, and its precipitin titre parallels its *in vitro* effect on the larvae.—M. L. B.

DESCHIENS, R., & NICOL, L. (1941). Recherche et dosage des anticorps dans l'ascaridiose par la méthode de la fixation du complément. **[Complement Fixation for the Diagnosis of Ascariasis in Horses].**—*C. R. Soc. Biol., Paris.* **135.** 516–520.

Complement-fixation tests were carried out on 26 horses infested with *Parascaris equorum*, and on 46 normal horses stated to be free from these worms. Of the infested animals, only six gave positive reactions. In four of these about 100 adult worms were found at autopsy, whilst the other two had only 10–20 worms. Of the 20 infested animals which gave negative reactions, two harboured 40–50 ascarids, and the other 18 had 5–10 ascarids each. There was no reaction in the 46 control horses. It is possible that localization of worms in, for example, the lungs or liver might have some influence on the reaction. The authors conclude that the amount of antibody produced is small, even in horses carrying as many as 100 ascarids.—M. L. BINGHAM.

DEOUELL, J. M. (1941). **Parasitic Gastro-Enteritis or Stomach Worm Disease of Sheep and Goats in Palestine.**—*Agric. Bull. Palestine.* April-June. pp. 192–196.

Stomach-worm disease is a serious menace to sheep and goats in Palestine. A short account is given of the disease and its treatment with a mixture of copper and nicotine sulphates. Preventive methods are not practicable in Palestine where there is scarcity of food and pastures.
—S. J. GILBERT.

REBRASSIER, R. E. (1941). **Gastrointestinal Parasites of Sheep and Their Control.**—*J. Amer. vet. med. Ass.* **98.** 124–128.

R. emphasizes the importance of management in the control of gastro-intestinal parasites of sheep. In the Department of Veterinary Research of Ohio State University, lambs are kept housed all the time up to the weaning period. The ewes are kept on pasture and are allowed with the lambs for nursing periods only. By this means the lambs are eventually pastured with a minimal parasitic infestation. It is suggested that weaned lambs should be pastured separately from adult sheep, preferably on pasture not grazed by sheep for 18 months. Pasture rotation at intervals of 2–3 weeks should be practised. By management along these lines parasitism may be controlled without recourse to anthelmintics. Nutrition is also important in controlling the effects of parasitism, and R. believes it necessary to supplement grazing with a grain ration.

Experiments were carried out on the efficiency of various anthelmintics, using groups of 12 animals dosed at intervals of three weeks. Drugs tried were copper sulphate, copper and nicotine sulphate mixture, sodium arsenite, tetrachlorethylene, and nicotine sulphate. At the end of the grazing season sheep were killed and worm counts made, a control group being included. Counts of the principal worms are recorded. The numbers of *Haemonchus contortus* were reduced fairly considerably by all the drugs, the best result being with tetrachlorethylene. *Ostertagia* was also reduced somewhat in numbers especially by tetrachlorethylene. In the following year the trials were varied slightly, the best results being obtained with $CuSO_4$ and nicotine sulphate alternated with tetrachlorethylene at two-weekly intervals. Phenothiazine was not used.

R. considers that regular winter dosing of adult sheep is of value in reducing the carry-over of infection. Dosing of half a flock [numbers not stated] with tetrachlorethylene every three weeks resulted in elimination of *Haemonchus* and *Ostertagia* and in considerable reduction of *Trichostrongylus* and *Cooperia*.—H. E. H.

I. TETLEY, J. H. (1941). **The Differentiation of the Eggs of Trichostrongylid Species *Nematodirus filicollis* and *N. spathiger*.**—*J. Parasit.* **27.** 473–480.

II. TETLEY, J. H. (1941). **The Egg-Laying Function of a Nematode as Shown by Study of *Nematodirus* Eggs in utero.**—*Ibid.* 481–491.

I. By plotting measurements of egg lengths against widths it was possible to distinguish *N. filicollis* from *N. spathiger*. The specific population groups were regarded as bivariate normal frequency distributions, and the range of the mean plus and minus twice the standard deviation, which included 91·2% of the population, was found to be 133–176μ × 69–86μ for eggs of *N. filicollis* and 179–210μ × 88–107μ for those of *N. spathiger*. Where the ranges of distribution overlapped only a small proportion of eggs fell outside these limits. Although malformed eggs were disregarded in these calculations, T. suggests that the presence of even a small number in the faeces is an expression of a phase of the host-parasite relationship adverse to the parasite.

II. From observations made upon the degree of segmentation and numbers of uterine eggs of *N. filicollis* and *N. spathiger*, T. has found that almost the entire worm population is laying eggs at any one time, and that the numbers of unsegmented eggs *in utero* is a measure of relative fecundity. Estimation of the absolute mean fecundity was made from faecal egg counts and the numbers of females found at autopsy, and refers to the modal rate of egg production at a particular point of time. Variations in the mean values relate to the egg production at a particular level for the whole population rather than to fluctuations in the numbers of females. Faecal egg counts are also an index of the response of the worm population to a particular set of conditions at a given time.—M. L. B.

TETLEY, J. H. (1941). **Spicule Length in *Cooperia curticei* as a Measure of Favorable Intestinal Environment for this Intestinal Nematode of Sheep.**—*J. Parasit.* **27.** 449–452.

Length of spicules was used as an index of growth of *C. curticei* collected from different parts of the small intestine of three sheep. T. found that in one sheep the spicules were considerably shorter than in the other two, but there was no significant difference in the mean lengths in any one sheep. He concludes, on the basis of these observations, that all parts of the intestine are equally suitable for growth of this parasite.—M. L. B.

DISEASES, GENERAL

SINEV, A. V., & RASTEGAEVA, A. M. (1939). Iktero-hemoglobinuriya loshadeĭ. **[Icterohaemoglobinuria in Horses].**—*Sovyet. Vet.* No. 8. 36–38.

Early symptoms are a slight rise in temperature (0·3–0·5°C. above normal), loss of appetite, and jaundice. During the acute stage the temperature rises to 39·5°C. and even higher. The authors give special attention to disturbances of the digestive system which accompany the jaundice. Blood and urine examinations show a lowering of the haemoglobin and erythrocyte content,

a pronounced haemolysis, a very high bilirubin index, and haemoglobinuria. In mild cases, limited to jaundice with no haemolysis or haemoglobinuria, treatment by intravenous administration of neosalvarsan is sufficient; in severe cases, with pronounced haemolysis, haemoglobinuria, and enlargement of the liver, administration of salvarsan and feeding on a strict diet is recommended, such as the exclusion from the ration of grain fodder and the addition of 1–2 kg. of bran and carrots each day. Glauber's salt is also recommended.—E. R. PARISER.

LANGHAM, R. F., & HALLMAN, E. T. (1940). **Some Observations on Nephritis in Horses.**—*Amer. J. vet. Res.* **1.** 49–52.

A histological study was made on the kidneys of 38 horses taken at random, most of them having been purchased for anatomical study, and aged six months to 27 years. In four cases the kidneys seemed normal and measurements of the various parts were made by the technique of maceration and by examination of stained sections. In general, the histology of the horse's kidney resembles that of the bovine, except that the distal convoluted tubule is very short and without obvious convolutions.

In eight animals there was some degree of focal interstitial nephritis. Striking changes were seen in the smaller arteries in 23 animals, the vessels most affected being those with a diameter of 100–200 μ. The intima was thickened due to proliferation of subendothelial connective tissue, the internal elastic lamina was in some cases fragmented and reduplicated, and there was hyalinization of the walls of some of the smaller arterioles. These arteriolar changes did not appear to have caused damage to the nephrons. [The arteriolar change seems to be an obliterating arteritis similar to that seen in vessels in the vicinity of parasitic aneurysms in the horse.]—E. G. WHITE.

VOGT. (1940). Morbus maculosus beim Kalb. **[Purpura in a Calf].**—*Berl. Münch. tierärztl. Wschr.* Sept. 27th. 472.

The author describes a single case of purpura in a three-week-old calf. Fifteen years previously he had observed two cases, this being the first case seen at the abattoir since that time. There were no clinical symptoms, but P.M. examination revealed characteristic haemorrhages on most internal organs and muscles.

BREED, F. (1942). **Some Swine Problems of the Future.**—*J. Amer. vet. med. Ass.* **100.** 27–32.

A review article dealing with the differential features of swine fever and swine erysipelas, and with pig pellagra and infectious gastro-enteritis (*Salmonella cholerae-suis* infection). B. states that little is known about the epizoology of swine erysipelas in the U.S.A.; he also refers to the extreme difficulty in producing the disease under experimental conditions. Apparently only one strain of *Erysipelothrix rhusiopathiae*, which would produce an acute septicaemia when injected into swine, has been recovered in the U.S.A. during the past few years; this strain lost its virulence after a number of passages.

The differences and similarities between pig pellagra and infectious gastro-enteritis—both diseases in which the digestive tract is involved—are discussed.—N. J. S.

BENKE, G. (1940). Sertések hóbetegsége. **[" Snow Disease " in Pigs].**—*Állatorv. Lapok.* **63.** 117–118.

" Snow disease " is a popular term in Hungary for abnormal farrowing in pigs in connexion with unfavourable weather conditions. B. investigated during the very severe winter of 1939–40 one herd of 24 sows. The animals had been exposed during pregnancy to a temperature of –20° to –30°C., and had been subsisting largely on maize, potato, and frozen swedes. Owing to the deep snow on the pastures, no grazing was possible. Losses from stillbirth and death soon after birth aggregated 34% of the litters. No brucellosis, swine fever or other infectious disease could be detected. Unsatisfactory housing and deficiency of minerals and vitamin D in the diet are considered to have been the cause of the condition.—J. CSONKA.

LASZLO, F. (1941). Beiträge zur pathologischen Anatomie der Akzessorischen Geschlechtsdrüsen des Schweines. **[Pathology of the Accessory Genital Glands in Swine].**—*Tierärztl. Rdsch.* **47.** 586–590.

L. shows that with early castration the accessory glands remain hypoplastic; they are small and undeveloped with the medulla of the gland round or oval, not ramified, and not secreting. With late castration there is macroscopically no difference in the accessory glands from the normal, although histologically it can be demonstrated that there is atrophy of glandular tissue and excessive growth of connective tissue, and though secretion has ceased, there is still some fluid left in the glands.

The eventual grey colouring of Cowper's glands is due to melanotic chromatophores in the connective tissue, though there are none in the epithelial cells.

Dilatation of the seminal vesicles is not uncommon in boars, and it is suggested that this is due to hypersecretion caused by abnormal sexual reactions rather than by the urine. An indication of the origin of the secretion is given by the fact that it occurs only in the fully developed or late castrated animal.

GREEN, R. G., LARSON, C. L., & BELL, J. F. (1939). **Shock Disease as the Cause of the Periodic Decimation of the Snowshoe Hare.**—*Amer. J. Hyg.* Sect. B. **30.** 83–102.

The authors discuss in detail the evidence upon which they base their belief that " shock disease " is responsible for the periodic decimation of wild snowshoe hare populations [see *V. B.* **10.** 444 and 692]. Earlier hypotheses of the causation of population cycles are reviewed, and it is shown that, as far as Minnesota and Douglas County, Wisconsin, are concerned, parasitism, tularaemia, and other recognized infectious diseases cannot account for the extraordinary fluctuations in mortality rate. In 1933, a " peak " year, there were 478 hares per square mile in a certain area; in 1938, a " low point " of 32 hares per square mile had been attained. A normal rate of reproduction was maintained throughout the period of decimation, and field and experimental observations both pointed to " shock disease " as the chief cause of loss. It is reasoned that these findings almost certainly hold for the whole of the North American region.

[Those readers who are interested in population dynamics should consult the text-book by C. ELTON—" Voles, Mice and Lemmings " (1942. Oxford: Clarendon Press. Price 30s.) The four sections of the book deal with vole and mouse plagues, fluctuations in north-west Europe, and wildlife cycles in Northern Labrador and the adjacent Ungava region. The subject of disease in sledge dogs is discussed in chapters XV and XXII.]—ALASTAIR N. WORDEN.

PETRZELA, O. (1939). Mocové kameny. **[Calculi of the Urinary System].**—*Zverolék. Rozpravy.* **13.** 87–89.

A general paper containing nothing new.—O. SPIRMANN.

HÁMORI, D. (1940). Örökléstani jegyzetek. I. Adatok a lovak kryptorchismusának átöröklésséhez. **[Heredity of Equine Cryptorchism].**—*Állatorv. Lapok.* **63.** 130–131.

Investigations into the offspring of cryptorchid stallions

in one state, and of one private stud, showed that a high percentage of their descendants were cryptorchids (in one case 11 of 17 descendants). H. considers the condition a hereditary anomaly and holds the stallions responsible for the transmission. Suggestions are made for legislative prohibition of the use of cryptorchid stallions in studs.—J. CSONKA.

BRANDT, G. W. (1941). **Achondroplasia in Calves.**—*J. Hered.* **32.** 183–186.
Two cases of achondroplasia, believed to be of the recessive type, are reported as having occurred, one in a non-pedigree Guernsey and the other in a non-pedigree Jersey. Mention is also made of a " bulldog " calf from purebred Ayrshire parents.—N. J. SCORGIE.

BERGE, S. (1941). **The Inheritance of Paralysed Hind Legs, Scrotal Hernia and Atresia Ani in Pigs.**—*J. Hered.* **32.** 271–274.
B. describes and analyses the occurrence of paralysed hind legs in a herd of Norwegian Landrace pigs. The data suggest that the condition is due to a monogenic recessive. In a survey of scrotal hernia, B. states that very few of the cases investigated had a genetic basis. An exception was a boar, where an incomplete dominant mode of inheritance was indicated with a manifestation ratio probably under 50%. The mode of inheritance of atresia ani was found to be irregular, and it is suggested that possibly two pairs of factors are involved.—N. J. S.

PRIBYL, E. (1939). Alopecia adnata u kuzlete. **[Congenital Alopecia in Kids].**—*Zverolék. Rozpravy.* **13.** 180–182.
A description of complete alopecia in twin kids of a goat that had recovered from foot and mouth disease. One kid died soon after birth and the second lived for 30 days. The animal was always shivering with cold and although supplied with vitamins and minerals, showed a craving for malt and clay. It gradually lost weight and became worse until death supervened. P. thinks that the condition was the result of endocrine disturbance, probably the pituitary, and regards this alopecia gene as a lethal factor.—O. SPIRMANN.

HUEPER, W. C. (1942). **Macromolecular Substances as Pathogenic Agents.**—*Arch. Path.* **33.** 267–290.
The part played by various macromolecular compounds (proteins, carbohydrates, or lipoids) in the production of certain pathological states is discussed but the macromolecular virus proteins are not dealt with. A brief chemical description is given of four macromolecular substances, *viz*, acacia, pectin, polyvinyl alcohol, and methyl cellulose, which have been used for the experimental production of macromolecular diseases such as glycogenosis, amyloidosis, and various lipoidoses. Evidence is presented which indicates that the presence in the blood and tissues of abnormal amounts of normal or abnormal macromolecular substances causes functional disturbances and morphological organic lesions directly related to, and characteristic of, macromolecular diseases. Resulting changes in the blood, *viz*, reduction in haemoglobin and number of erythrocytes, leucopenia or leucocytosis, increased sedimentation of erythrocytes, impaired coagulation mechanism and possibly impairment of oxygenation of erythrocytes, are designated as the macromolecular haematologic syndrome.
The changes caused by the intracellular and extracellular storage of macromolecular substances are organic enlargement, and formation of parenchymatous and histiocytic-endothelial foam cells; the phagocytic cells of the liver, spleen, and lymph nodes are also affected, as well as ganglion cells of the brain, and the endothelial cells of large and small blood vessels including the glomerular capillaries. Degenerative vascular changes, often resembling or identical with atheromatous or arteriosclerotic lesions are found in many macromolecular disorders.—R. ALLCROFT.

NUTRITIONAL AND METABOLIC DISORDERS

PICKUP, J. (1942). **A Further Case of Fits due Apparently to Dietary Deficiency in Young Pigs.**—*Vet. Rec.* **54.** 97–98.
Symptoms similar to, although less severe than, those previously described [see *V. B.* **10.** 49.] occurred in all ten members of a newly weaned Large White × Middle White crossbred litter which was receiving a diet of middlings only. Fits developed five days after weaning, and one animal died without significant lesions within two days. The diet was changed to one of equal parts of bran and middlings, together with fairly liberal quantities of milk, and yeast, chalk, and common salt. Eight of the nine survivors made rapid returns to normal health and the ninth recovered more slowly: further fits were not observed.
It is suggested that in this case the deficiency was probably one of Ca, and that the fits were prerachitic in nature.—ALASTAIR N. WORDEN.

MUSSILL, J. (1941). Zinkmangel als Ursache des Nichtrinderns. **[Zinc Deficiency as Cause of Infertility in Cows].**—*Wien. tierärztl. Mschr.* **28.** 136–137.
Sterility of unknown origin in cows in the Pinzgau region did not yield to treatment with vitamin E or hormones but was cured by administration of zinc oxide. This suggested a lack of zinc in the pastures or in the winter feed as a possible cause of failure to breed. An oestrogenic effect of zinc has been reported by two other observers.—A. M. COPPING.

SENIOR, B. J., & SHEEHY, E. J. (1941). **Laying Fowl and Growing Chickens Require Vitamin A.**—*J. Dep. Agric. Eire.* **38.** 374–381.
Owing to the curtailment of supplies of cod liver oil and yellow maize, poultry are now largely dependent upon fresh or dried green foods for their vitamin A.
Experiments were carried out in which a sample of dried pasture grass was used to replace cod liver oil and yellow maize. The grass meal contained an average of 30 mg. carotene per 100 g. dry matter. As a vitamin A source when fed to laying pullets at a level of 10% it gave as good results as 30% yellow maize.
From an experiment with very young chicks, the authors conclude that 5% grass meal provided sufficient vitamin A for growing stock. [The data given do not appear to justify this conclusion since the basal ration was low in riboflavin, a factor also present in grass meal.]
—F. D. ASPLIN.

OPPER, L. (1941). **Effect of Renal Damage on the Toxicity of Hypervitaminosis D in Rats.**—*Arch. Path.* **31.** 569–577.
In two series of experiments, renal damage was induced in young rats by subjection, respectively, to chronic vitamin A deficiency and to removal of one kidney plus ligation of half the other. Large doses of vitamin D (as viosterol) induced arterial calcification and deposits of Ca in the tissues of 40 vitamin A deficient animals, but not in litter-mate controls which had received carotene supplements. Calcium deposition was likewise induced by hypervitaminosis D in 27 animals which had been partially nephrectomized, and in these the serum inorganic P (but not serum Ca) was markedly elevated as compared with that of intact controls.—A. N. W.

I. Adamstone, F. B. (1941). **Brain Degeneration in Young Chicks Reared on an Iron-Treated Vitamin E-Deficient Ration.**—*Arch. Path.* **31.** 603–612.

II. Adamstone, F. B. (1941). **Erythrophagocytosis in Chicks Reared on a Vitamin E-Deficient Ration Supplemented with Halibut Liver Oil.**—*Ibid.* 613–621.

III. Adamstone, F. B. (1941). **Histologic Evidence Indicative of the Natural Occurrence of Vitamin E Deficiency in the Chick.**—*Ibid.* 622–626.

IV. Adamstone, F. B. (1941). **Relation of Vitamin E to the Effectiveness of Testosterone Injected into Caponized Male Fowls.**—*Ibid.* 706–710.

V. Adamstone, F. B. (1941). **Cholesterol Content of Brain in Nutritional Encephalomalacia of Vitamin E-Deficient Chicks.**—*Ibid.* 711–716.

VI. Adamstone, F. B. (1941). **Reticulum Cell Sarcoma Following Ulceration of the Intestine in Vitamin E Deficient Chicks.**—*Ibid.* 717–721.

I. Nutritional encephalomalacia occurred in chicks fed on a diet of natural foodstuffs which had been treated with ferric chloride in ether to destroy vitamin E. The disease occurred when the ether had been removed by evaporation at 34·6°C. and not when the ether was allowed to evaporate in the open air without heat. Both methods seem equally good at bringing about the destruction of vitamin E. Vitamin E rich supplements reduced the incidence of the disease from 29% to 6%, but did not entirely prevent it. A. concludes that encephalomalacia is caused by deficiencies of at least two factors occurring simultaneously, *viz*, vitamin E and a heat-labile substance.

II. A. describes yet another syndrome in chicks fed on a diet of natural foods treated with ferric chloride in ether. The condition now described occurred when vitamins A and D were supplied in the form of halibut liver oil, but not when cod or sardine liver oil was fed. Lesions were small but unmistakable at eight weeks and later they became more pronounced. Macroscopically the liver was enlarged and friable and marked by dark mahogany brown spots. The marrow of the long bones was firm and dark red. On microscopic examination the liver sinusoids were found to be widened and engorged with blood cells. The liver cells were enlarged and there was a marked increase in the monocytes and Kupffer cells; there was extensive evidence of phagocytosis of erythrocytes. The bone marrow showed a progressive replacement of adipose tissue by myeloid tissue. The destruction of red cells was accompanied by a deposition of iron in the form of small granules in the liver cells and phagocytes.

It is suggested that the treatment of the food resulted in the destruction of some substance essential to the red blood cells which is available in cod or sardine liver oil but not in halibut liver oil.

III. Spontaneous haemorrhage sometimes occurred in 72-hour-old chick embryos when they were removed from the shell with great care, this definitely not being due to the manipulation. Groups of cells in rosette-like clusters occurred at the site of rupture of the vessels. Normal embryonic blood vessels, although delicate, possess a remarkable degree of elasticity and do not readily break. It is concluded that a vitamin E deficiency in the egg was the cause of the haemorrhagic condition and that vitamin K could not be incriminated.

IV. White Leghorn capons fed on a ferric chloride treated, vitamin E deficient ration from the time of hatching did not utilize intramuscular injections of testosterone as efficiently as capons on the same diet with α-tocopherol supplements. Capons on an untreated ration responded immediately to testosterone. It is concluded that in the fowl, vitamin E is necessary in the diet to ensure effective utilization of androgen.

V. The cholesterol content of the brain of the healthy chick increases until the beginning of the third week of age and then diminishes slowly. The cholesterol level of the brain of chicks with encephalomalacia is normal at 16 days and then falls rapidly. The estimations indicate that there is a disturbance in cholesterol metabolism in this disease.

VI. Proliferative lesions occurring in the lower part of the intestine and sometimes extending into the caeca of chicks are described. These occurred in chicks which had been fed on a ferric chloride treated, vitamin E deficient diet, supplemented with cod liver oil or sardine oil. They did not occur when halibut liver oil supplied the vitamin A and D supplement. The lesions consisted of irregularly flattened expansions of tissue projecting into the lumen and spreading over the inner surface of the intestine. They varied in size from minute projections to 1 cm. in diameter and were sometimes so numerous as to become confluent; perforation occurred in two cases. The histological structure and development of the lesion are described.—F. D. Asplin.

Adamstone, F. B. (1941). **Relation of Vitamin E to Substances of the Anthracene Group.**—*Arch. Path* **31.** 722–730.

A brief review is given of the reactions to vitamin E deficiency described by different investigators in rats, rabbits, g. pigs, ducks, turkeys, and chicks. It is suggested that the function of this vitamin is necessary for the normal and efficient utilization of substances of the anthracene group including cholesterol, calciferol, ergosterol, androgen, oestrogens, and some carcinogenic compounds.—R. Allcroft.

Mackenzie, C. G., & McCollum, E. V. (1941). **Muscular Dystrophy in the Absence of Testicular Degeneration in Vitamin E Deficiency.**—*Proc. Soc. exp. Biol., N.Y.* **47.** 148–152.

Experiments indicate that on the vitamin E deficient diet employed, the rabbit's skeletal muscles are more susceptible to pathological alterations than the testes. This effect of E deficiency is contrary to that observed in rats in which testicular degeneration is specific.

—R. Allcroft.

Bethke, R. M., & Record, P. R. (1942). **The Relation of Riboflavin to Growth and Curled-toe Paralysis in Chicks.**—*Poult. Sci.* **21.** 147–154.

The observations reported in this paper clear up several points in relation to riboflavin deficiency in chicks.

Synthetic and naturally occurring riboflavin were found to be equally effective in preventing curled-toe paralysis and in promoting growth in chicks. It had previously been noted that addition of some products to a basal diet deficient in riboflavin gave an increased incidence of curled-toe paralysis; neither practically riboflavin-free pork liver fractions, dried molasses, nor rice bran concentrate free of riboflavin, affected the incidence of curled-toe paralysis.

No significant difference was found in the riboflavin requirement per 100 g. food between White Leghorn and crossbred chicks. The riboflavin requirement for the prevention of curled toe paralysis was found to be about 50 μg. per 100 g. of food above that required for maximum growth.

Riboflavin was found to be essential for efficient food utilization.—F. D. Asplin.

Antopol, W., & Unna, K. (1942). **Pathologic Aspect of Nutritional Deficiencies of Rats. I. Lesions Produced by Diets Free of Vitamin B_6 (Pyridoxine) and the Response to Vitamin B_6.**—*Arch. Path.* **33.** 241–258.

The lesions are described which occur in rats maintained on a diet free from vitamin B_6, and the effect of supple-

menting these basal diets with various other members of the B complex was observed in order to differentiate between vitamin B_6 deficiency and other deficiencies of the B complex. Histological examinations were made of the ears, abdominal skin, paws, snouts, livers, adrenals, bones, and testes of more than 300 rats on the B_6 deficient diets. It is pointed out that it is extremely difficult to distinguish changes which are due to B_6 deficiency *per se* from the nonspecific secondary changes due to malnutrition and infection, but it is concluded that the cutaneous lesions (hyperkeratosis) of the ears, paws, and snout, together with the oedema of the corium, are characteristic of vitamin B_6 deficiency in rats.—R. ALLCROFT.

FOY, J. R., & CERECEDO, L. R. (1941). **The Effect of Protein on Vitamin B_6 Deficiency.**—*Abstr. 102nd Meet. Amer. chem. Soc., 1941.* p. B24.
It is shown that rats on a high protein diet (45% casein) deficient in vitamin B_6 develop acrodynia more quickly and more severely than rats on a lower protein diet (30% casein) also deficient in B_6. Rats receiving a 15% casein diet did not show any signs of dermatitis over a period of ten weeks, but when put on to a 45% casein diet all developed dermatitis within 15 days and died within 25 days. No evidence of acrodynia was observed in mice given a 60% casein diet deficient in B_6 although the high protein level did suppress growth and shorten the life of these animals.—R. ALLCROFT.

BAUERNFEIND, J. C., NORRIS, L. C., & HEUSER, G. F. (1942). **The Pantothenic Acid Requirement of Chicks.**—*Poult. Sci.* **21.** 142–146.
A naturally occurring dermatosis similar to the experimental form produced by pantothenic acid deficiency led the authors to investigate the quantitative requirement of chicks for pantothenic acid and the amount present in foods.

Young Single Comb White Leghorn chicks observed for their first six weeks of life were found to require 500–550 μg. of pantothenic acid per 100 g. of diet for the prevention of dermatosis and approximately 600 μg. per 100 g. for maximum growth. In a single experiment the pantothenic acid requirement of Rhode Island Red chicks was found to be slightly less. These estimations are much lower than those made by JUKES.

It is calculated that the pantothenic acid of normal chick diets used in the U.S.A. varies from 1,290–1,700 μg. per 100 g. of diet.—F. D. ASPLIN.

MILLS, R. C., SHAW, J. H., ELVEHJEM, C. A., & PHILLIPS, P. H. (1940). **Curative Effect of Pantothenic Acid on Adrenal Necrosis.**—*Proc. Soc. exp. Biol., N.Y.* **45.** 482–484.
Newly weaned rats developed haemorrhagic cortical necrosis of the adrenal glands in 12 out of 15 cases after 4–6 weeks on a diet comprising sucrose, extracted casein, maize oil, minerals, and various B vitamins including choline but not pantothenic acid. In seven other rats receiving very large doses of choline (300 mg. per 100 g. diet), the lesions appeared to be even more severe. The condition was completely prevented in 32 control animals receiving varying doses of calcium pantothenate.—ALASTAIR N. WORDEN.

JACOBI, H. P., & BAUMANN, C. A. (1942). **The Biochemical Defect in Choline-Deficient Rats.**—*J. biol. Chem.* **142.** 65–76.
Renal haemorrhage was induced in young rats by feeding a diet deficient in choline and in other sources of "labile methyl" groups [see *V. B.* **12.** 231–232]. The choline content of the haemorrhagic kidneys and of other tissues of such rats was found to be slightly higher than that of normal animals. In further experiments, in which diets low in methionine as well as in choline, were fed, the choline-content of the tissues was within the range of normal animals, and the same was true in the case of rats which had been fed on low-fat or selenium-containing diets in order to lower the "labile methyl" supply. The authors conclude that symptoms of "choline deficiency" are due to lack of some methyl-containing substance other than choline.

The renal haemorrhage which occurred in rats on diets deficient in methionine could be cured by choline. Sarcosine did not protect against renal haemorrhage.

It was found possible to rear rats to maturity, and for such animals to reproduce, on a synthetic 25% casein diet from which choline was omitted.—A. N. WORDEN.

HALNAN, E. T. (1942). **Rate of Growth as a Factor in the Incidence of Gizzard Erosion in Chicks.**—*Poult. Sci.* **21.** 189–192.
In view of the inconsistent results obtained by various investigators in the aetiology of gizzard erosion in chicks, H. puts forward some observations suggesting that the rate of growth has a considerable effect on the development of lesions.

None of a group of 26 chicks fed a cereal basal ration developed gizzard erosion. All of two groups of 26 each fed a similar diet, but in which growth had been materially increased by the inclusion of whole meal, showed some degree of gizzard erosion. It is suggested that the appearance of gizzard erosion was due to increased growth rate produced by the addition of whole meal and not to the presence of a causative agent in the whole meal.—F. D. ASPLIN.

GRATZL, E., & POMMER, A. (1941). Möller-Barlowsche Krankheit beim Hund. [**Scurvy in Dogs**].—*Wien. tierärztl. Mschr.* **28.** 481–492, 513–519 and 531–537.
Extensive clinical details with an account of X-ray and histological findings are given for ten cases of scurvy in dogs seen during seven years of veterinary practice. The condition was found only in young animals aged 4–6 months. A febrile attack was the usual form of onset with severe pains in the limbs and swellings of the metaphyses, probably due to extravasation of blood under the periosteum. The bone changes shown by X-ray and sections were characteristic of scurvy and in no case resembled those of rickets or polyarthritis, so that differential diagnosis was not difficult. Subperiosteal haemorrhage was found at many sites, thus further confirming the nature of the deficiency.

In spite of the scorbutic nature of the lesions no cure was obtained by treatment with vitamin C preparations or with a diet rich in vitamin C and the illness developed in dogs apparently well supplied with vitamin C. Of the ten cases, four recovered spontaneously after 6–7 weeks of illness and the others were killed during the initial acute attack. It is suggested that since the dog is able to synthesize vitamin C, scurvy only occurs when there is some form of interference with this synthesis within the organism. When this interference ceases synthesis again takes place and spontaneous cures result.—A. M. COPPING.

PHYSIOLOGY

HORNBY, H. E. (1942). **Temperature of Mammals. [Correspondence].**—*Trans. R. Soc. trop. Med. Hyg.* **35.** 239–240.
Criticising VANDERPLANK's observations on the influence of the temperature of the mammalial host on the virulence of trypanosomes to rats, H. points out that in experiments in California it was found that the rectal temperatures of cows remained constant at 101–101·3°F.

in a room at a temperature of 40°–70°F., but above that point the temperature steadily increased till it reached 105·1°F. at temperatures of 100°F. In tropical climates reliance can only be placed on animal temperatures taken early in the morning, and from records of temperatures taken before breakfast at the Mpwapwa veterinary laboratory, it is considered that the normal temperature of sheep is 102°F. and of goats 101·3°F., but that in either species the temperature may vary from 100°–103°F. In young animals there is a greater variation than in adults.—U. F. RICHARDSON.

BARCLAY, A. E., BARCROFT, J., BARRON, D. H., FRANKLIN, K. J., & PRICHARD, M. M. L. (1941). **Studies of the Foetal Circulation and of Certain Changes that Take Place after Birth.**—*Amer. J. Anat.* **69.** 383–406.

By means of X-ray cinematography and injections of radio-opaque substances into the bloodstream, pictorial records were made of the circulation through the heart of the sheep foetus delivered by Caesarian section. The evidence obtained indicates that the parts supplied by the left heart, including the heart muscle and the brain, receive preferential treatment in respect of the supply of oxygen during foetal life. The functional closure of both the ductus arteriosus and foramen ovale were also studied radiographically. Closure of these structures occurs in a few minutes after birth, if the umbilical cord is ligated and respiration begins and continues normally. The closure of the foramen ovale, however, seems to be more intimately connected with the onset of respiration than with ligation of the cord, for it can occur before the cord is tied off if respiration is proceeding well.—N. J. SCORGIE.

I. GRAU, H. (1941). Zur Benennung der Lymphknoten, hier : die Lymphknoten des Beckeneingangs und der Beckenhöhle. **[Nomenclature of Lymph Nodes of Pelvic Inlet and Cavity]**.—*Berl. Münch. tierärztl. Wschr.* May 16th. 237–241.

II. KELLER, H. (1941). Ueber den Ln. iliacus lateralis des Rindes im Zusammenhang mit der Fleischbeschau. **[Lateral Iliac Lymph Nodes of Cattle in Connexion with Meat Inspection]**.—*Z. Fleisch- u. Milchhyg.* **52.** 25–26.

III. KELLER, H. (1941). Ueber die Lnn. sacrales externi (Kreuzlymphknoten) des Schweines. **[External Sacral Lymph Nodes of the Pig]**.—*Ibid.* 41–43.

I. G. states that the nomenclature of the l.nn. within the pelvic cavity of the various domestic animals is confusing, and suggests that, from the point of view of determining the spread of lymph-borne infection, they be named in accordance with their drainage and relation to the terminal branches of the aorta. All l.nn. associated with the origin of the main iliac arteries would thus be classed as internal (medial) iliac, and those associated with the branches of the circumflex iliac artery as external (lateral) iliac. The exception is that whereas the proximity of the l.nn. on the femoral artery of the horse to the inguinal canal confirms the name " deep inguinal ", the name " deep femoral " applied to the similar l.nn. in the ox and dog is better suited to their more distal position.

II. Although the position of the external (lateral) l.nn. at the bifurcation of the circumflex iliac vessels is constant they may be difficult to expose in the abattoir. An incision at a point where a line drawn parallel with, and immediately below, the tuber coxae met a line drawn at right angles to the promontory (first segment) of the sacrum revealed the node deeply embedded in fat. Of the 30 carcasses examined, in only 11 was it present on both sides, in five it was present on the left, and in four on the right. In no case was there more than one node on either side. Its inspection is of importance in the diagnosis of tuberculous peritonitis and suspected infections of the hind limb and udder.

III. The ischiatic l.nn. in the pig, which are situated immediately dorsal and medial to the superior ischiatic spine, would be better named the external (lateral) sacral as they receive afferent vessels from most of the pelvic contents ventral to the sacrum. Efferent vessels from the popliteal also drain into this l.n. An incision in a carcass at a point where a perpendicular dropped from the middle of the pubic symphysis towards the sacrum met a line drawn parallel with, and two fingers' breadth ventral from, the ventral aspect of the sacrum revealed the l.n. Commonly two l.nn. were present on the same side. In 14 of 71 carcasses examined it was present on both sides, in 12 only on the left, and in seven only on the right. Because of the difficulty of exposing lymphoid tissue at this site in the normal animal, it should be examined in all cases of suspected generalized T.B., as in such cases, infection of these l.nn. often coincides with infection of other irregular l.nn. in the abdominal cavity.—C. W. OTTAWAY.

TRUM, B. F. (1940). **The Days of Oestrus During Which a Mare will Conceive.**—*Vet. Bull. U.S. Army.* **34.** 234–241.

T. has studied the records of 825 oestrous cycles in the mares of a U.S. Army stud, and has analysed the results of breeding on different days of the heat period. About 70% of the oestrous periods recorded lasted 4–7 days, although one mare remained in oestrus 32 days. T. found that, contrary to the opinion of some workers, the percentage of conceptions did not become lower the earlier in oestrus the mating was made, and that a satisfactory number of conceptions occurred when service took place on any of the first 5 days of oestrus ; conception could take place at any time between 27 days and one day before the end of oestrus. T. concludes from these data that mating during the first days of oestrus is just as successful as later in the period ; furthermore, there appears to be no reason for the practice of breeding mares a certain number of days before the end of oestrus, since the duration of oestrus and the time of ovulation from the end of oestrus as determined by pregnancies are too variable. The records of the stud also show that there is little value in serving a mare more than once during a heat period. Thus, 60% of the mares served only once conceived, 59% served twice conceived, and 67% served three times or more conceived.—N. J. SCORGIE.

HERMAN, H. A., & SWANSON, E. W. (1941). **Variations in Dairy Bull Semen with Respect to its Use in Artificial Insemination.**—*Res. Bull. Mo. agric. Exp. Sta.* No. 326. pp. 82.

A critical examination of the semen from 342 separate ejaculates representing 55 dairy bulls, whose breeding efficiency was known, was made in order to compare the actual efficiency of the semen used in artificial insemination with the results of physical and chemical examinations of the sample. Variations were observed in all properties studied in different ejaculates of the same bull, as well as in ejaculates of different bulls. Although variations in initial motility and pH were not great the duration of vigorous motility varied considerably as did the percentage of abnormal spermatozoa. The time of survival in storage at 40°F. was found to be a good index of the fertility of the semen ; good quality semen maintained its fertility for at least 3–5 days when kept at this temperature. Survival time of semen which was normally of good quality was not increased by dilution with any of the common diluents used. Survival of semen from a few bulls was materially increased by

dilution with egg-yolk-buffer diluent; the semen normally became thick and viscous in storage and the diluent apparently prevented this or other deleterious effects. The pH, initial motility, and percentage of abnormal spermatozoa were found to be related to fertility of the semen to only a limited extent. Semen of high pH, 7·0 or higher, was usually of very low viability. Semen of poor initial motility survived only a short time. A normal pH, good initial motility, and low percentage of abnormal spermatozoa were an indication but not an assurance of good fertility. Morphologically abnormal spermatozoa were found in every sample of semen examined. Bulls which produced semen averaging 30% of abnormal spermatozoa were usually of poor fertility, but not all samples of semen containing over 30% abnormals were infertile. The most common types of abnormality, in order of their occurrence, were coiling of tails, taillessness, and pyriform shape. The general conclusion is that the fertility of a bull cannot be accurately estimated from examination of a single sample of semen. Three or more semen samples examined several days, or even weeks apart, with accompanying data of the bull's actual breeding record, provide the most accurate method of evaluating fertility. An extensive bibliography is given.—N. J. S.

BLAIR, G. W. S., FOLLEY, S. J., COPPEN, F. M. V., & MALPRESS, F. H. (1941). **Rheological Properties of Bovine Cervical Secretions during the Oestrus Cycle. [Correspondence].**—*Nature, Lond.* **147.** 453–454.

A preliminary note which outlines a method for the diagnosis of oestrus in cattle by determining the flow-elasticity of the cervical secretions. [See also *V. B.* **12.** 359.]—N. J. SCORGIE.

*HARTMANN, F. (1939). Untersuchungen über das Eutersekret bei tragenden und nichttragenden Färsen. **[Udder Secretion in Pregnant and Non-Pregnant Heifers].**—*Inaug. Diss., Hanover.* [Abst. from abst. in *Berl. Münch. tierärztl. Wschr.* Feb. 28th. 105. (1941)].

The degree of udder secretion found in 125 non-pregnant and 75 pregnant heifers did not depend upon age, feeding, or udder size. H. classified the secretions of non-pregnant animals into the following groups :– (1) thin, clear, or slightly cloudy from all teats (33%); (2) thin, yellow or honey-like from all teats (14%); (3) no secretion (14%), and (4) different types from the teats, the viscous fluid being found in none (25%) or in 1–3 teats (6%). In group (2) a persistant corpus luteum was found; in group (3) the udder was flaccid and weak.

In pregnant animals, the findings were similar to those in the non-pregnant animals for the first three months. From the 4th–8th month a viscous, honey-like, or clear secretion was found in 70%. This became more milky, bloodstained, and like colostrum as pregnancy proceeded. There were few cells in the secretions, mostly in the cloudy types. By the appearance of the secretion, pregnancy can be diagnosed in about 70% of cases between the 4th and 8th month.—J. G. CARR.

MAUGER, H. M., Jr. (1941). **The Autonomic Innervation of the Female Genitalia in the Domestic Fowl and its Correlation with the Aortic Branchings.**—*Amer. J. vet. Res.* **2.** 447–452.

The ages of the birds used in this study varied from 48-hour embryos to mature laying hens. It was observed that the abdominal nerve plexuses were intimately correlated with the aortic branches, and in order to differentiate nerves from blood vessels a colour resin was injected into the latter. It was found that the extrinsic nerve supply to the ovary and oviduct was obtained from abdominal and pelvic plexuses of the sympathetic system and also from the posterior continuation of the sympathetic trunk. The cloaca received its nerve supply from the pelvic plexus and from the sacral and coccygeal nerves. An account is also given of the chief aortic branches. The ovary receives its blood supply from the ovarian artery and a branch of the left renal. The oviduct is supplied by the left renal or left femoral, the left sciatic and the left internal iliac. The cloaca is supplied principally from the internal iliac arteries.—N. J. SCORGIE.

VENZKE, W. G., & GILMORE, J. W. (1940). **Histological Observations on the Epiphysis Cerebri and on the Choroid Plexus of the Third Ventricle of the Dog.**—*Proc. Iowa Acad. Sci.* **47.** 409–413.

The pineal body and the choroid plexus of the third ventricle were examined in dogs of various ages by a variety of histological techniques carried out on material which had been removed and fixed immediately following death. An earlier worker's estimate of the pineal index (ratio of weight to total brain weight) was confirmed as being about 0·005.

The pineal parenchyma was found to be poorly vascularized and to show no evidence of lobulation. Two types of nuclei were distinguished, the first being large and pale and containing conspicuous nucleoli and small chromatin granules, and the second type being smaller and darker, more homogeneous in nature, and containing larger chromatin granules : both types were surrounded by scanty amounts of protoplasm from which ran out a few pointed processes which did not have the club-shaped ends noted in comparable human material.

Histological observations made on the choroid plexus appeared to confirm the results of other workers, except that a striated cuticular border could not be demonstrated in the epithelial cells.—ALASTAIR N. WORDEN.

MONTABAUR, J. (1941). Beitrag zur Kenntnis von der Membrana pupillaris persistens des Hundes. **[Contribution to the Knowledge of the Membrana Pupillaris Persistens of the Dog].**—*Arch. wiss. prakt. Tierheilk.* **76.** 219–229.

Development, resorption, and regressive development of the embryonic tunica vasculosa lentis are reviewed and its abnormal persistence in the dog as the membrana pupillaris persistens corneae adhaerens is described. The membrane consists of a thin, laminar cover in the central and paracentral part of the deep face of the cornea raised up as a low wall with 6–8 single threads running back from it to the iris. The endothelial layer of the cornea is absent from the part which is covered by the membrane. The microscopic appearance is described. Insufficient development of the corneal endothelium and of Decemet's membrane is said to be responsible for the persistence and adhesion of the membrane. The condition was seen in 11 out of 784 dogs' eyes. Three cases are described in dogs, one of which was examined P.M.—E. R. PARISER.

MILLER, M. E., & WITTER, R. E. (1942). **Applied Anatomy of the External Ear of the Dog.**—*Cornell Vet.* **22.** 64–86.

The authors first review the general structure, form, and muscular tissue associated with the outer ear with particular reference to the cartilagenous folds.

The blood vessels are distributed in pattern on the convex surface of the flap only, the supply to the concave surface is derived from small branches of these vessels which penetrate the numerous foramina in the cartilage. In this connexion it is suggested that haematomas are caused by rupture of these vessels at their point of penetration and that the bleeding occurs between the

cartilage and the perichondrium on the concave surface of the ear flap.

The motor nerves to the auricular muscles arise from the 7th cranial (facial). The sensory nerves to the convex surface arise from the 2nd cervical, the dorsal branch (occipital nerve) passes subcutaneously over the wing of the atlas to supply the cranial three-fourths of this surface. The ventral branch (the great auricular nerve) crosses the edge of the wing of the atlas to supply the caudal three-fourths of this surface. The sensory supply to the concave surface is more complicated and the area of greatest sensitivity is around the area of the auditory canal and the concha. The internal auricular nerve is a branch of the 7th cranial with which are incorporated nerve fibres of the 5th cranial. It arises deep to the parotid gland and immediately divides into two branches which penetrate the auricular cartilage to ramify on the concave surface. The auricular branch of the 5th cranial—mandibular division—arises behind the masseter muscle and passes in front of the auditory canal to the concave surface. Fairly good results were obtained with local anaesthesia in desensitizing the ear for operative purposes. Three sites were used, *viz*, at the base of the convex surface, immediately caudal to the auditory canal, and deep in the tissues under the parotid gland.

Sections of ears from chronic cases of otorrhoea revealed thickening of the epithelium, keratinization of the hair follicles and the appearance of apocrine glands. These glands, which are only present in diseased tissue, are modified sweat glands, and in the opinion of the authors they are responsible for the dark-brown secretion characteristic of chronic otorrhoea.—C. W. Ottaway.

Vritiš, V., & Kubiček, J. (1938). **Kozní zlaznaté orgány ovce (antorbitální, inguinální a interdigitální) a jejich vyvoj. [The Skin Glands of Sheep].**—*Zverolék. Rozpravy.* **12.** 160–168 and 169–187.

A general paper describing the glands in sheep.—O. S.

Hammond, J. C., & Bird, H. R. (1942). **Size of Thymus and Bursa Fabricius in Relation to Rate of Growth in Chicks.**—*Poult. Sci.* **21.** 116–119.

The weights and lengths of the various portions of the alimentary tract and the weights of other organs, expressed as a percentage of the live weight, are given. The thymus gland and bursa of Fabricius of rapidly growing chicks were proportionately larger than those of slowly growing chicks. The results do not appear to have any special significance.—F. D. Asplin.

Wicks, L. F. (1941). **Sex and Proteinuria of Mice.**—*Proc. Soc. exp. Biol., N.Y.* **48.** 395–400.

Urine analyses of mice of various ages from nine pure strains and from mixed stock animals showed that proteinuria occurred to a considerable extent in males from three weeks of age onwards but in greatly reduced intensity in females even when they were quite old. In young, castrated males the degree of proteinuria remained unchanged for many weeks following operation, but it greatly decreased after about three months. Chemical investigation indicated that the protein was a nucleoprotein.—R. Allcroft.

POISONS AND POISONING

Danckwortt, P. W., & Hoffmann, W. (1941). **Der Gehalt der Leber an Zink und anderen Metallen bei Tierschädigungen durch Fabrikabgase. [The Amount of Zinc and Other Metals in the Liver of Animals Poisoned by Factory Smokes].**—*Dtsch. tierärztl. Wschr.* **49.** 523–525.

Values for the Zn, Pb, and As_2O_3 content of normal livers are given, and compared with other results in the literature. The livers of some horses near a factory dealing with Zn and Pb ores were analysed, and increased values were found in some cases.—J. G. Carr.

Glock, G. E., Lowater, F., & Murray, M. M. (1941). **The Retention and Elimination of Fluorine in Bones.**—*Biochem. J.* **35.** 1235–1239.

In observations made it was found that there was a gradual increase in the F content of the bones of human subjects (not including cases of fluorosis) from early life to senility. The extremes of the range found were 0·02% and 0·3%. Experiments with rats receiving a diet supplemented to the extent of 0·05% with NaF showed increased skeletal uptake of F throughout the course of the experiment (84 weeks). The uptake was very large during the first five weeks of the experiment. Withdrawal of NaF was followed by a rapid elimination of F from the skeleton. In the human bone studies, data were given for Ca, P, Mg, and percentage ash in rib bones.—J. Duckworth.

Cabrera, D. J. (1941). **Effects of Sulphur on Growing Chickens.**—*Philipp. J. anim. Indust.* **8.** 89–97.

From an experiment involving 40 chicks, C. concludes that continuous feeding of S at a level of 2% by volume of the ration is definitely harmful. The toxic effect was more marked in chicks which were three weeks old at the commencement of S feeding than in eight-week-old chicks. Symptoms noted were inhibition of growth, poor feathering, and abrasions of the skin particularly over the region of the crop. The mucosa of the anterior part of the intestine showed petechiae.

It is suggested that the parasiticidal activity of S in coccidiosis is due to the production of hydrogen sulphide which renders the intestinal contents acid.—F. D. Asplin.

I. Clark, A. (1940). **Cyanic Poisons in Food Plants.**—*J. trop. Med. (Hyg.).* **43.** 52–54.

II. Clark, A. (1940). **Effects Arising from Respiratory Inhibition and from Anoxaemia.**—*Ibid.* 91–96.

III. Clark, A. (1940). **Effects Arising from Inhibition of Cellular Activities. No. 3.—Selenium.**—*Ibid.* 250–252.

IV. Clark, A. (1940). **On the Individual Resistance of Animals to the Effects of Poisonous Food Plants.**—*Ibid.* 276–279.

I. Evidence is presented and discussed suggesting that "coast disease" may not be due to a cobalt deficiency but to the presence in the pastures of cyanogenetic plants such as clover, mallee, and other legumes. It may be that the oximes which are present in leguminous plants are sources of cyanogenetic glucosides and that the symptoms associated with "coast disease" may arise from cyanic poisoning. It has been shown that Co prevents and cures the disease, but it is suggested that this curative action may be due to the fact that Co combines with oximes to form a very stable, insoluble compound; the ferrous and cuprous salts are much less stable. Also the haemopoietic action of Co is well known. Thus Co could prevent and cure the disease by forming an inactive compound with the oxime inhibiting its biological activity. Reports of other cases of HCN poisoning of stock by plants are discussed. It is suggested that an outbreak of blindness among cattle reported by McNutt & Wall [*V. B.* **9.** 575.] may have been due to HCN poisoning and not to a vitamin A deficiency.

II & III. General speculative papers in which the theory is advanced that certain deficiency diseases such as " coast disease " and pellagra in man and blacktongue in dogs are due not so much to a mineral or vitamin deficiency but to the presence in the pastures or food of some poisonous substance such as HCN or fluorine [see also *V. B.* **10.** 59]. Cyanic substances are powerful inhibitory poisons which produc partial or complete inhibition of cellular respiration and disordered metabolism and thus arrest the beneficial action of vitamins and hormones. They may occur endogenously as well as exogenously, being produced by perverted protein metabolism. In support of this theory the incidence of pellagra in different parts of the world is correlated to high consumption of cyanogenetic foods such as maize, millet, or cassava and to a decrease in the severity when wheat was substituted for the other cereals and when sulphur-containing foods such as dates and apricots were also consumed. These latter foods are beneficial because of the detoxicating function of sulphur; similarly it is postulated that the beneficial effect of Co is due to its detoxicating effect on the cyanogenetic plants present in the pastures.

The inhibitory effects of fluorine are also briefly discussed and it is stated that some clinical and pathological findings of F poisoning resemble those of cyanic poisoning.

In a general discussion of the occurrence and symptomatology of Se poisoning it is pointed out that Se is an irritant substance as well as an inhibitor of cellular activities. The similarity of the symptoms and pathology arising from chronic poisoning by cyanic substances and by Se is discussed. It is stated that both these classes of poisons cause a deficiency of organic S in the tissues of animals ingesting them; in cyanic poisoning S is used as a detoxicant and is thus diverted from its normal metabolic function, while Se is able to replace S in compounds such as cystine and keratin, producing substances useless for metabolism.

IV. Experiments on rats fed different varieties of cassava showed that there was great individual variation in the resistance of these animals to the cyanogenetic substance present in this root. The average duration of life was much less than that of rats on other restricted diets. A marked prolongation of life of rats fed on the toxic aroid tuber " tannia " (*Xanthosoma*) was effected by addition of pure cholesterol or foods rich in cholesterol to the diet. This effect is analogous to the protection from cyanic poisoning afforded by organic sulphur. The fact that none of the experimental rats lived to their normal span of life, although their resistance varied so greatly, explains the irregular incidence of grosser pathological changes found amongst man and animals consuming a large proportion of toxic foods. [See also *V. B.* **10.** 59.]—R. ALLCROFT.

HUMPHREYS, E. M., & DONALDSON, L. (1941). **Degeneration of the Adrenal Cortex Produced by Germanin.**—*Amer. J. Path.* **17.** 767–775.

Histological examination of adrenals and kidneys from 100 g. pigs, 30 rats, 8 rabbits and 3 dogs after administration of various doses of germanin showed that this drug has a selective action in damaging the adrenal cortex equal to or surpassing its ability to injure renal tubular epithelium. Toxic doses of germanin (0·3–0·4 g. per kg. body weight) consistently produced zonal degeneration of the adrenal cortex in g. pigs; small serial doses, comparable to those in therapeutic use in man, produced similar but less intense lesions. In both rats and rabbits adrenal lesions similar to those of g. pigs were observed, but no lesions were found in the three dogs, all young animals, which were given a small series of injections with minimum doses. It is suggested that germanin has occasionally caused cytotoxic atrophy of the adrenal glands in human patients with pemphigus, and the necessity is stressed for systematic morphologic studies in chemotherapy.—R. ALLCROFT.

THERAPEUTICS

—. (1941). **Medical Research Council. Therapeutic Requirements Committee. First Supplement to War Memorandum No. 3. Economy in the Use of Drugs in War-time.** pp. 4. [fcp] [Mimeographed].

The list has been prepared in order to restrict import of drugs to the minimum which is really necessary in respect of home consumption and for the supply of raw materials for the export trade. It is based on the B.P.1932, including Addenda 1936 and 1940 and the B.P.C. 1934. No veterinary sera and vaccines are included, but assurance is given that substances of this class which are of proved efficacy will be freely available. Proprietary names of drugs are not used except where it has seemed unavoidable. The drugs are divided into three sections, *viz*, (1) drugs which are at present either (a) regarded as essential or (b) readily available; (2) drugs which are essential for certain purposes but not for others, and in the use of which strict economy should be observed, and (3) drugs which are not essential and do not justify importation or manufacture for home use in war time.

In an appendix are listed those drugs, whose production within the British Empire is recommended. —J. M. ROBSON.

POUNDEN, W. D. (1941). **Deferred Milking—A Method of Handling Acute Streptococcal Mastitis Cases.**—*Cornell Vet.* **31.** 339–344.

This report covers the treatment of 16 cases (two given in detail) of acute parenchymatous mastitis (four severe and the others mild) due to streptococci of slight or negative haemolytic power. Milking was deferred from the beginning of the attack for not more than three days, by which time the acute inflammation had invariably subsided and milk production had returned to almost normal; the udders functioned normally at the next lactation. The method contrasts with the usual practice of frequent milking and is considered worthy of further trial under the conditions set out in the report. P. notes, however, that one case of severe catarrhal mastitis failed to respond, and that the method would probably not be applicable to cases of *Corynebacterium pyogenes* or staphylococcal mastitis.—E. COTCHIN.

SEELEMANN, M., & NOTTBOHM, H. (1940). Die Kapff-Säurebegasung zur Behandlung des gelben Galtes. **[The Kapff Acid-Gas Treatment of Streptococcal Mastitis].**—*Tierärztl. Rdsch.* **46.** 445–447.

The Kapff acid-gas treatment [see also ANDRES—*V. B.* **11.** 897.] was applied to streptococcus-infected bovine udders for periods up to 16 hours. Milk secretion decreased markedly on the day of treatment but rose to normal after a few days. Of six animals with udders artificially infected with streptococci, two were cured; although treatment was repeated three, four, and five times in the other animals, there was no response. Animals which had not been cured by this remedy were treated by entozon and trypaflavine and in all cases the infection was cleared up.—E. R. PARISER.

*SEELEMANN, M., & SIEMONSEN, K. (1940). Ueber die Wirkung glyzerin- und saccharosehaltiger Akridin-

farbstofflösungen auf gesunde und streptokokken-infizierte Euterviertel. **[Action of Glycerin- and Saccharose-Containing Acridine Solutions on Healthy and Streptococcus-Infected Udder Quarters].**—*Tierärztl. Rdsch.* 377–381. [Abst. from abst. in *Zbl. Bakt. I.* (*Ref.*). **139.** 336].

In comparative udder infusion trials it was found that there was no advantage in adding glycerin or saccharose to the infusion fluid, with the idea of making the acridine solution hypertonic.

*Paradies, H. H. (1939). Behandlungsversuch mit Jodpräparaten bei der Bangbakterieninfektion. **[Experimental Iodine Therapy of Bovine Brucellosis].**—*Inaug. Diss., Hanover.* [Abst. from abst. in *Zbl. Bakt. I.* (*Ref.*). **139.** 324].

In a controlled experiment on 38 cows in four herds an iodized hydrocarbon given subcutaneously and KI given *per os* had no preventive effect on brucella abortion.

Messing, S. (1941). Kombinierte Lachesis-Therapie bei einem an Wundstarrkrampf erkrankten Pferde. **[Combined Lachesis Therapy in a Horse with Tetanus].**—*Berl. Much. tierärztl. Wschr.* Oct. 3rd. 484.

The treatment, based on homeopathic principles, consisted in the administration of lachesis together with belladona and arsenic and veratrum. The animal recovered.—J. M. Robson.

Henderson, H. J., & Long, E. R. (1941). **Effect of Chlorin-e-Rhodin-g on Experimental Tuberculosis.**—*Proc. Soc. exp. Biol., N.Y.* **48.** 435–437.

Both human and bovine type tubercle bacilli were inhibited *in vitro* by the sodium salt of chlorin-e-rhodin-g, breakdown products of chlorophyll. Intravenous injection of the substance to rabbits experimentally infected with bovine type tubercle bacilli had no inhibitory effect on the course of the disease. The pigment accumulated in large quantity in phagocytic cells in the spleen and bone marrow.—R. Allcroft.

Winshaw, H. C., & Feldman, W. H. (1941). **Treatment of Experimental Tuberculosis. Use of Sodium *p,p'*-diamidodiphenylsulfone-*n'*-didextrose sulfonate ("Promin") with Notes on Some Toxic Effects Observed in Man.**—*J. Amer. med. Ass.* **117.** 1066–1068.

Eighty g. pigs were inoculated with a lethal dose of human tubercle bacilli (0·0005 mg. of strain H 37 RV) and then divided into eight groups consisting of one group of 12 untreated controls, a group treated with promin from the day of infection, a group in which treatment was begun two days before infection, and groups treated from three days, one week, two weeks, four weeks and six weeks respectively after infection. The drug was mixed with the food in a concentration of 1%, and the average amount consumed by each animal was 300–400 mg.

The experiment ran for 189 days, by which time all the control animals had died of visceral TB. 88% of the treated animals were still alive and none of the 11 which had died showed "grossly detectable visceral tuberculosis". Of the remainder which were killed 41 (60%) showed no gross lesion of TB., and in 24 of the remaining 27 animals the grossly visible lesions were limited to tiny nodules at the site of inoculation. Only three animals had visceral TB. There were no significant differences in the various groups of treated animals.—J. E.

Curnen, E. C., & MacLeod, C. M. (1942). **The Effect of Sulfapyridine upon the Development of Immunity to Pneumococcus in Rabbits.**—*J. exp. Med.* **75.** 77–92.

Sulphapyridine administered to rabbits during the period of developing immunity after a single intravenous injection of heat-killed pneumococcus (type I), exerted no influence upon the immune response. Active immunity, as indicated by increased resistance to homologous intradermal infection, was present 48 hours after the immunizing injection and two days before circulating type-specific antibodies were detectable.—J. M. Robson.

Longacre, A. B., & Horold, E. (1941). **Sulfanilamide, Sulfapyridine, Sulfathiazole, and Sulfamethylthiazol in Experimental Gas Gangrene in Guinea Pigs.**—*Proc. Soc. exp. Biol., N.Y.* **46.** 9–14.

A strain of *Clostridium welchii*, isolated from a fulminating case of gas gangrene, was injected into the thigh muscles of g. pigs; it proved very virulent. The intraperitoneal administration of sulphanilamide and sulphapyridine did not in any way modify the course of the infection. Most of the g. pigs treated with sulphathiazole and sulphamethylthiazole developed typical gas gangrene and succumbed, but the development of the infection was delayed and in many instances was not as extensive as in the g. pigs treated with sulphanilamide and sulphapyridine.—J. M. Robson.

White, H. J., Litchfield, J. T., Jr., & Marshall, E. K., Jr. (1941). **Quantitative Comparisons of the Activity of Sulfanilamide, Sulfapyridine, Sulfathiazole, and Sulfadiazine against *Escherichia coli* in vivo and in vitro.**—*J. Pharmacol.* **73.** 104–118.

The greater part of this paper deals with research on the sulphonamide compounds. The substances tried against *Bacterium coli* infection in mice were decreasingly active in the following order:—sulphadiazine, sulphathiazole, sulphapyridine, sulphanilamide, and the same order of activity was found *in vitro* by determining minimal inhibitory concentrations.—D. G. Davey.

Cameron, H. S., & McOmie, W. A. (1941). **Blood-Concentration Studies on Sulfanilylguanidine in Swine and Sheep.**—*Cornell Vet.* **31.** 321–330.

When sulphanilylguanidine was given orally to swine in doses of 1, 5, and 20 g. per 20 lb. body weight, a maximum concentration of the drug in the blood was reached in about 6–8 hours after administration; within 24 hours the concentration sometimes dropped to half this amount. No toxic symptoms followed such treatment, nor did they occur when 1 g. per 20 lb. body weight was given twice a day for five days. Repeated dosing at this rate was, however, fatal to lambs, and at 10 g. per 20 lb. body weight it was fatal to swine. The only pronounced pathological change produced by lethal doses occurred in the kidneys, and was probably due to the accumulation in these organs of the insoluble acetylated derivative.—D. G. Davey.

McCarty, M., & Tillett, W. S. (1941). **The Inactivating Effect of Sulfapyridine on the Leukocytic Action of Benzene.**—*J. exp. Med.* **74.** 531–544.

A pronounced leucopenia can be produced in adult rabbits by the subcutaneous injection of a mixture of equal parts of benzene and olive oil in daily doses of 5·0 ml. This leucotoxic action of benzene is inhibited by the concurrent administration *per os* of sodium sulphapyridine monohydrate in twice-daily doses of 1·25 g., but not by the concurrent administration of *p*-aminobenzoic acid. The action of the sulphapyridine is not due to the development of a compensating leucocytosis. There is, however, some evidence to suggest that it reduces the amount of benzene oxidized to phenolic compounds, which would explain its action if it could also be shown that it is the phenolic compounds which have the leucotoxic effect.—D. G. Davey.

KEENEY, E. L., PEMBROKE, R. H., & CHATARD, F. E. (1941). **Sulfathiazole Ointment in the Treatment of Cutaneous Infections.**—*J. Amer. med. Ass.* **117.** 1415–1417.

5% sulphathiazole in equal parts of hydrous wool fat and vanishing cream was used. It appeared to be efficacious in the treatment of infected eczema, seborrhoeic dermatitis, impetigo, acne vulgaris, bacterial folliculitis and furunculosis. No toxic effects were observed, and in six infants that received applications over half the body surface three times a day the blood concentration of the drug ranged from 2·0–3·5 mg.%.

—J. M. ROBSON.

CLIMENKO, D. R., BARLOW, O. W., & WRIGHT, A. W. (1941). **Influence of Sodium Bicarbonate in Preventing Renal Lesions from Massive Doses of Sulfathiazole.**—*Arch. Path.* **32.** 889–894.

When a dose level of sulphathiazole is used which kills most of the experimental animals (monkeys) and produces severe renal lesions in all, it is possible to prevent fatalities and also to inhibit the formation of multiple local inflammatory lesions in the kidney by the administration of large quantities of sodium bicarbonate. This is probably due to the fact that sulphathiazole and its acetyl derivative are much more soluble in alkaline than in acid media; the maintenance of an alkaline urine thus prevents the precipitation of the drug in the kidney and the consequent formation of local lesions.

—J. M. ROBSON.

FULTON, J. D., & WARRINGTON YORKE. (1941). **Studies in Chemotherapy. XXVII.—Further Observations on the Stability of Drug-Resistance in Trypanosomes. XXVIII.—Drug-Resistance in Babesia Infections.**—*Ann. trop. Med. Parasit.* **35.** 221–227 and 229–232. [For previous parts, see *V. B.* **11.** 639].

XXVII. A brief review is given of drug resistance to *T. rhodesiense*, and the history of a number of strains of the organism, made resistant to various drugs since 1929, is brought up to date. Significant points are:– (a) a strain made resistant to one aromatic arsenical or antimonial compound becomes resistant to other aromatic arsenicals and antimonials; (b) strains made resistant to aromatic arsenicals are sensitive to tartar emetic, but those made resistant to aromatic antimonials are also resistant to tartar emetic; (c) resistance to Bayer 205 is specific; (d) strains made resistant to either guanidine or anidine compounds are resistant to both groups; (e) an atoxyl-fast strain (in mice) has maintained this character for 12½ years; (f) resistance to Bayer 205 may become progressively less; (g) an undecane diamidine-fast strain in mice, another in rabbits, and a synthalin-fast strain in rabbits lost some of their resistance in a year and all of it within four years.

XXVIII. A strain of *B. canis*, made resistant to 4 : 4′-diamidino stilbene in June-August 1939, was passaged through 42 dogs during a period of 28 months, but the resistance of the strain to the drug persisted unchanged. The strain was also proved to be resistant to 4 : 4′-diamidino diphenoxy propane, and, what is more interesting, to Bayer's acaprin.—D. G. DAVEY.

I. DAUBNEY, R., & HUDSON, J. R. (1941). **The Action of Two Aromatic Diamidines on *Trypanosoma congolense* Infections in Cattle; with a Note on Delayed Poisoning by 4 : 4′-Diamidino Diphenoxy Pentane.**—*Ann. trop. Med. Parasit.* **35.** 175–186.

II. DAUBNEY, R., & HUDSON, J. R. (1941). **A Note on the Chemotherapeutic Action of 4 : 4′-Diamidino Stilbene in Babesia Infections of Domestic Animals.**—*Ibid.* 187–190.

III. CARMICHAEL, J., & FIENNES, R. N. T.-W. (1941). **Treatment of Canine Babesiasis by 4 : 4′-Diamidino Diphenoxy Propane.**—*Ibid.* 191–193.

Each of these studies is based on the earlier work of LOURIE & YORKE [*V. B.* **11.** 58.] on the chemotherapeutic action of aromatic diamidines.

I. Using cattle inoculated with a local (Kenya), relatively highly virulent strain of *T. congolense*, experiments were made on the chemotherapeutic effect of 4 : 4′-diamidino stilbene and 4 : 4′-diamidino diphenoxy pentane. Neither drug effected a complete cure. 4 : 4′-diamidino stilbene in single doses as high as 20 mg. per kg. body weight, given intravenously, cleared the blood of parasites for only 16 days, while three doses of 5 mg. per kg. body weight, given at intervals of seven days, brought about no more than a premunized state. This state could also be attained by the subcutaneous injection of 4 : 4′-diamidino diphenoxy pentane at a dose rate of 2·5 mg. per kg. body weight given on three occasions at intervals of 14 days, but this drug proved much more toxic for cattle than the stilbene. In one case, when it was given intravenously in a dose as low as 10 mg. per kg. body weight, it caused the collapse of the animal within a minute, and death within an hour. Also, subcutaneous doses of 5 mg. per kg. body weight repeated at intervals of 7 or 14 days sometimes proved fatal. A curious feature of the toxic effect of this drug, following its subcutaneous injection, was the occasional delay (as much as 14 days) in the appearance of untoward symptoms. The blood changes produced by the intoxication are described, and the major pathological effects listed. The most noteworthy of the latter was an advanced fatty degeneration of the liver.

II. Fifteen clinical cases of *B. canis* infection in dogs were given 4 : 4′-diamidino stilbene subcutaneously at a dose rate of 1·5 mg. per kg. body weight. Thirteen of the treated animals made rapid clinical recoveries; the remaining two, both advanced cases, died. Another dog, given only 0·9 mg. per kg. body weight, relapsed four days later and was then treated with acaprin and clinically cured. Most of the treated dogs exhibited symptoms of hyperaesthesia for about 20 min. after receiving the drug, and more than half of them had a transient swelling of the face, particularly of the lips. The authors, however, consider the drug useful for the treatment of clinical cases of *B. canis* infection.

They also received reports of the action of the drug in two cases of *B. equi* infection. Both horses were dosed at 1·5 mg. per kg. body weight, and both exhibited pronounced symptoms of hyperaesthesia, one for a few hours and the other for 48 hours. A rapid remission of the fever occurred in each case. Because of the hyperaesthesia reported in these two cases, the drug was given at the same dose rate to a 1,200 lb. thoroughbred horse. Within 10 min. the animal "became restless and excited, neighing and sweating profusely" and kicking. It was normal again within five hours, but nevertheless the authors consider that the drug cannot be regarded as suitable for administration to horses.

III. The authors consider that 4 : 4′-diamidino diphenoxy propane is better than trypan blue, acaprin, pirevan, and akiron R for the treatment of *B. canis* infection in dogs. They recommend that it be administered intramuscularly either in a single dose of 5 mg. per kg. body weight, or in two doses, each at half this rate, on successive days. Subcutaneous injection is also effective, but it has the disadvantage of causing oedematous swellings. 102 dogs were successfully cured by the first course of treatment, while ten which relapsed were successfully cured by a second course. The drug appears to have a wide margin of safety.—D. G. DAVEY.

KNOWLES, R. H., & BLOUNT, W. P. (1941). **Experimental Observations on Phenothiazine Relative to the Treatment of Equine Strongylosis.**—*J. R. Army vet. Cps.* **12.** 51–65.

Egg and worm counts were carried out before and after administration of phenothiazine to 39 horses of varying ages. A dose of 30 g. per horse was given. In 40% of cases the egg count was increased for a short time after treatment, but in most cases the count was reduced to zero by the fourth day, and remained so for about five weeks. Worms appeared in the faeces some 30 hours after treatment, reaching a peak at about the 41st hour. The total number of worms passed was determined by counting all worms in a 20 g. sample of faeces, in conjunction with calculations based on the amount of faeces passed.

In the case of poultry the only effective dose against *Heterakis gallinae* was the highest dose given, 0·64 g.

[There is some discussion of the pharmacology of phenothiazine, much of which is incompatible with the findings of other workers.—ED.]—M. L. BINGHAM.

HOFFMANN, W. (1941). Ueber den Gehalt der Milch an organischen Chlorverbindungen nach Behandlungen der Kühe mit Hexachloraethan. **[The Amount of Organic Chlorine Compounds in Milk after Treatment of Cows with Hexachlorethane].**—*Dtsch. tierärztl. Wschr.* **49.** 527–528.

After treatment with hexachlorethane the milk fat was found to contain at least 5·9 mg. of organic Cl per 100 g.

—J. G. CARR.

MONTGOMERIE, R. F., & BROWNLEE, G. (1941). **The Treatment of Anoestrus in Domestic Animals with Stilboestrol Dipropionate.**—*Vet. Rec.* **53.** 567–568.

A short note in which it is stated that in the non-pregnant anoestrous bovine, a single intramuscular injection of stilboestrol invariably results in oestrus in a few days to be followed by a regular succession of normal cycles. The authors also state that cows, and particularly heifers, nearly always conceive when mated at the first oestrus after treatment. Doses of stilboestrol suggested are :– cows and heifers, Channel Island breeds 10 mg. ; heavier breeds 20 mg. ; ewes 1 mg. ; sows 5 mg. ; bitches 2 mg.—N. J. SCORGIE.

FOLLEY, S. J., & MALPRESS, F. H. (1941). **Bovine Sterility : The Use of Oestrogens for the Induction of Oestrus in Anoestrous Cattle.**—*Vet. Rec.* **53.** 551.

Preliminary results indicate that a single intramuscular injection of 10 mg. oestradiol dipropionate is sufficient to induce oestrus in anoestrous cows and heifers. A smaller dosage (5 mg.) may probably be equally effective and this possibility is under investigation. In most of the animals treated with the oestrogen, regular oestrus cycles were re-established, but conception did not usually follow service at the induced oestrus. These findings confirm the work of STEINACH *et al.* (1934) who also established that oestrogen treatment was effective in cases of anoestrus due to a persistent corpus luteum.

—N. J. SCORGIE.

BROWNLEE, G. (1942). **The Physiological Basis for the Use of Oestrogens in Veterinary Practice. I. The Clinical Application of Stilboestrol Dipropionate.** —*Vet. Rec.* **54.** 104–105.

GOULD, G. N. (1942). **The Physiological Basis for the Use of Oestrogens in Veterinary Practice. II. The Use of Stilboestrol in the Field.**—*Ibid.* 105.

STUART, K. (1942). **The Physiological Basis for the Use of Oestrogens in Veterinary Practice. III. Two Cases of Mummified Foetus Treated with Stilboestrol.** —*Ibid.* 106.

I. A hypothesis is advanced to explain the mode of action of stilboestrol. In the normal oestrous cycle it is believed that the rising level of blood oestrogen during metoestrus and dioestrus leads to two direct results, *viz*, (a) regression of the functional corpus luteum, and (b) direct stimulation of the anterior pituitary which results in the secretion of follicle-stimulating hormone and luteinizing hormone. From this it follows that the oestrogen secreted by the ovary is the controlling mechanism in the sex endocrine cycle. If this hypothesis is correct, it is then argued that for the treatment of anoestrus a precise dose of stilboestrol is needed in order to duplicate the " plateau " level achieved by the normal ovary.

The mechanism by which the expulsion of retained foetus or of pus in cases of pyometra is achieved by the use of stilboestrol is explained by the thesis that the injection raises the blood-oestrogen level to that stage at which the corpus luteum regresses and the uterus becomes potentiated to the action of the oxytocic principle of the posterior pituitary, which stimulates contraction of the uterus.

II. Oestrus usually followed within six days, but sometimes as late as 11 days, after the injection of stilboestrol into anoestrous heifers. G. recommends withholding service at the induced oestrus. Of six cases checked by rectal examination, it was found that in five the ovaries contained corpora lutea ten days after heat, indicating that ovulation had occurred ; in the remaining case heat without ovulation resulted from the injection.

III. Two case reports are presented in which retained mummified foetus was successfully treated by the intramuscular injection of 25 mg. of stilboestrol. In one of the cases posterior pituitary extract was administered after the cow had begun to discharge uterine contents ; this resulted in the expulsion of the foetus after a few hours interval. In the other case no posterior pituitary extract was given, but the foetus was easily removed by manual interference.—N. J. SCORGIE.

*MEYER-JENSEN, G. (1941). Ufrugtbarhedsbehandling hos Kvaegt specielt med Henblik paa Hormonpraeparaters Anvendelighed. **[Treatment of Sterility in Cattle by Hormones].**—*Medlemsbl. danske Dyrlaegeforen.* p. 235. [Abst. from abst. in *Skand. VetTidskr.* **31.** 303].

In addition to the symptomatic treatment of sterility by massage of the ovaries and lavage of the uterus, 250 units of prolan were injected. In 46 out of 47 cows, oestrus appeared within three weeks, and fertility proved to be 79%.

LIESS, J. (1941). Versuche zur Wirkung des Sexocretin " Merck " bei Rindern. **[Action of " Sexocretin " Merck (Synthetic Oestrogen) in Cattle].**—*Dtsch. tierärztl. Wschr.* **49.** 633–634.

L. summarizes the results of investigations on " sexocretin " [said to be synthetic oestrone], carried out at the Berlin veterinary school. The following claims are made. A subcutaneous or intramuscular injection of 5 ml. of " sexocretin " produces oestrus within 24 hours. Slow intravenous injections produce an effect after 12 hours. Oral administration of the preparation in gelatin capsules produces oestrus in 24 hours. Oestrus is accompanied by readiness to mate. The preparation will induce oestrus in the presence of the corpus luteum, and during pregnancy (6–9 months) without producing abortion, and produces only a slight and transitory inhibition of lactation. Oestrus can be induced during anaphrodisia due to a persistent corpus luteum or to underactivity of the ovaries.—J. M. R.

TANNER, F. W., & APPLING, J. W. (1941). **Bactericidal Effect of Ultraviolet Rays on Non-Spore Forming**

Bacteria and Mold Spores.—*Proc. Soc. exp. Biol., N.Y.* **47.** 47–51.

The results show that the initial number of cells influences survival of micro-organisms exposed to ultra-violet light, and therefore dilute suspensions are destroyed more quickly than heavy ones. The bacteria used were *Staphylococcus aureus*, two strains of *Bacterium coli*, and *Serratia marcescens*, the first being most resistant and the last least resistant to the bactericidal effect of the rays. The mold spores studied were *Aspergillus glaucus*, *A. niger*, a *Mucor* and a *Penicillium*, the first being most resistant and the *Mucor* least. Exposure of cardboard strips inoculated by immersion indicated that indirect irradiation is much less effective than direct irradiation.—R. ALLCROFT.

GARROD, L. P. (1942). **The Selective Bacteriostatic Action of Gentian Violet.**—*Brit. med. J.* Feb. 28th. 290–291.

A wide gap separates the susceptibility to gentian violet of streptococci from that of staphylococci, other indifferent Gram-positive cocci, diphtheroids, aerobic spore-bearing bacilli, moulds, and yeast-like fungi. Thus, a medium containing about 1 : 500,000 of gentian violet will eliminate most of the nonpathogenic flora of air and dust. It is also suitable for the isolation of streptococci from skin and wound exudates.—J. M. R.

HOYLE, C., SPENCE, J. W., & FAULKNER, S. H. (1942). **Zinc Peroxide Preparations with Notes on Clinical Uses.**—*Lancet.* **242.** 7–9.

Ordinary paraffins are the most satisfactory vehicles for ointments containing zinc peroxide, and nut oil (oleum arachis B.P.) for liquid suspensions. Glyceryl monostearate is a good suspending agent for oil suspensions, and a suitable formula is 10% of absolute zinc peroxide with 3% of monostearate with nut oil to 100. Preliminary clinical trials indicate that in this form the peroxide is at least as active as in simple watery suspension; and the stability, consistency, and flexibility in use are advantages which make it preferable. —J. M. R.

PUBLIC HEALTH

LEINEMANN. (1941). Die Aenderungen der Ausführungsbestimmungen zum Reichsfleischbeschaugesetz. **[Changes in Executive Instructions Concerning the German Meat Inspection Law].**—*Tierärztl. Rdsch.* **47.** 208–210.

L. systematically reviews those paragraphs which are new and those which have been modified since the previous alterations of the instructions on May 15th, 1937. Only a few regulations are new, *e.g.* emergency slaughtering can only be carried out in " police slaughterhouses " or on a date different from that on which healthy animals are slaughtered, and the manufacture of therapeutic preparations from meat which has been declared unfit for consumption has been made illegal. Instructions concerning diseased animals have been changed, especially in the case of TB. The presence or absence of tubercle bacilli that have been disseminated by the blood stream is the basis for the new regulation deciding whether the entire carcass is to be declared unfit for consumption. Precise instructions are given as to when TB. can be regarded as local. There are new regulations on trichina infection and on many other conditions and technicalities.—E. R. P.

LOCKAU, U. (1941). Die Fleischbeschau im ehemaligen Polen. **[Meat Inspection in the Former Republic of Poland].**—*Dtsch. tierärztl. Wschr.* **49.** 549–553.

Before 1918, the year of the establishment of the Polish Republic, and up to 1929, meat inspection in Poland was carried out in the different areas according to either Prussian, Austrian, or Russian regulations. In 1929 a new meat inspection law, valid for the whole of the Republic, was introduced. This law was modelled so closely on corresponding German regulations that it has been left unaltered under the present German occupation administration. During the Republic, nearly all meat inspection was carried out by veterinary surgeons, lay inspectors being employed only in a few rural areas. Domestic slaughtering was not subject to compulsory meat inspection. According to L., meat inspection reached a higher level of efficiency in the western provinces than in the rest of Poland.

Statistics were available for the years 1934–37 concerning the incidence of infectious and parasitic diseases in animals sent to the abattoirs. Most of L.'s figures, however, do not cover the whole of Poland and consequently, can form no more than a basis for general observations. Of the major infectious diseases, anthrax, blackleg, and rabies were encountered only very rarely. A few cases of glanders were met with and also of bovine contagious pleuro-pneumonia; haemorrhagic septicaemia in bovines was rather frequent. Swine fever and swine erysipelas were observed in a good many instances. The incidence of tuberculosis was markedly lower than that recorded in corresponding German statistics.

Fasciola hepatica was very prevalent in cattle and sheep, and echinococci were also frequently found. L. is able to give figures for the incidence of cysticerci and trichinae in all pigs and cattle slaughtered during 1935. *C. bovis* occurred in 0·1% of cattle, and *C. cellulosae* in 0·35% and trichinae in 0·05% of pigs.—M. LANDAU.

TECHNIQUE AND APPARATUS

I. ROBINSON, L., & STOVALL, W. D. (1941). **Factors Influencing the Demonstration of Tubercle Bacilli by Concentration Methods.**—*J. Lab. clin. Med.* **27.** 84–91.

II. —. (1942). **Report of the Committee on Standard Laboratory Procedure. Minimum Laboratory Standards.**—*Amer. Rev. Tuberc.* **45.** 103–114.

I. In order to improve the detection of tubercle bacilli in pathological fluids, R. compared the digesting power of NaOH with other agents which break down mucus and cellular elements, such as calcium hydroxide, ammonium hydroxide, sulphuric acid, trypsin, caroid (a vegetable ferment), and certain organic solvents. The conclusion is reached that the newer techniques show little advantage over the NaOH method followed by long centrifugation. The importance of using a large amount of material is stressed.

II. The Committee of the Trudeau Society has made a recommendation in regard to a minimum procedure for the examination of suspected sputa and other fluids for TB. For direct smear examinations the sputa, coagulated by heat and concentrated by centrifugation, are rendered homogenous by NaOH or by HCl. The low-heat, Ziehl-Neelsen method of staining is recommended. If direct smears are negative, alkali- or acid-treated material is seeded on Löwenstein's medium (slight modification) and Petragnani's medium.

The article contains numerous details which should

be consulted in the original by those interested.
—R. E. GLOVER.

LIND, H. E., & SHAUGHNESSY, H. J. (1942). **Fluorescent Staining Technique for Detection of Acid-Fast Bacilli.**—*J. Lab. clin. Med.* **27.** 531–536.
A comparison was made between the classical Ziehl-Neelsen method and a fluorescent technique [see *V. B.* **12.** 317.] for the detection of TB. in sputa and spinal fluids.

A total of 1,123 specimens of sputa were tested : 998 were negative and 106 were positive by both methods. Twelve were positive by fluorescence and were negative by Ziehl-Neelsen. Seven of those positive by Ziehl-Neelsen were negative by fluorescence. The authors claim that the simplicity of the fluorescence technique and the ability to detect the bacilli with a fairly low power objective permit a larger number of specimens to be handled in a shorter period of time. Certain disadvantages of the method, mainly concerned with extraneous fluorescence, are discussed.—R. E. GLOVER.

MUDD, S., & ANDERSON, T. F. (1941). **Demonstration by the Electron Microscope of the Combination of Antibodies with Flagellar and Somatic Antigens.**—*J. Immunol.* **42.** 251–266.
The sensitization of flagellate typhoid and paratyphoid bacilli, and of *Bacillus subtilis*, by rabbit antiserum was studied by means of the electron microscope which, by extending resolving power to a practical limit of about 50Å, allows investigation of structures hitherto beyond the range of direct examination. The deposition of antibody films on body and flagellar surfaces is directly demonstrated. The flagella become more conspicuous, thicker, less sharp and less uniform in outline, and tend to cohere. The bacterial cell walls become more opaque and less clear-cut in outline. From a study of photomicrographs, the authors draw the tentative conclusion that, with increasingly strong sensitization, the deposition of antibodies proceeds from a patchy distribution to a uniform film, which is at first the thickness of the minor axis of the antibody-globulin molecules ; later the film is the thickness of the long axis of the molecules, which are radially disposed about the sensitized surface.—E. C.

KING, E. J., HASLEWOOD, G. A. D., DELORY, G. E., & BEALL, D. (1942). **Micro-Chemical Methods of Blood Analysis. Revised and Extended.**—*Lancet.* **242.** 207–209.
The authors have extended and revised, in part, their system of blood micro-analysis. The substances for which new methods, or revisions, are given are : urea, N.P.N., inorganic P, glucose, total sulphonamides (with differentiation into free and conjugated sulphonamides) total protein, fibrin, albumin, globulin, phosphatase, Na, and K. Sulphapyridine and sulphathiazole, since they are chemically related, can be estimated by the method for sulphanilamide.—J. DUCKWORTH.

I. HADEN, R. L. (1940). **A New Instrument for the Diffractometric Measurement of the Diameter of Red Blood Cells.**—*J. Lab. clin. Med.* **25.** 399–403.
II. COX, R. T., & PONDER, E. (1941). **A New Form of Diffractometer.**—*J. gen. Physiol.* **24.** 619–624.
I. An instrument is described for measuring the diameter of r.b.c. The principle on which the instrument is based is that the diameter of the coronas cast by the erythrocytes varies inversely as the size of the particles and inversely as the distance of the cells from the light source. A film is made of the blood sample and the position of the slide, relative to the light source, is adjusted to produce a corona of a standard size. The diameter of the cell is then read directly from the scale. Results are given for cell diameters in normal subjects and in cases of congenital haemolytic icterus, obstructive jaundice, pernicious anaemia and idiopathic hypochromic anaemia in human beings. The instrument is known as the Haden-Hansser erythrocytometer.
II. A description is given of a simple form of diffractometer. The light source is a mercury arc. The light is rendered parallel and monochromatic. The diffraction pattern is photographed and the measurements made by a simplified form of microphotometer. The results for cell radius and cell volume agree well with those obtained by other methods.—J. DUCKWORTH.

WILSON, W. M. (1942). **A Quick, Easy Method of Preparing Tissues for Microscopic Examination by Combining the Techniques of Nelson and Terry.**—*J. Lab. clin. Med.* **27.** 537–542.
The system described depends on the combination of a method described by NELSON (1935) with one by TERRY (1937). In the Nelson technique, small pieces of tissue are placed in a solution of egg-albumen crystals contained in a parchment box, and are simultaneously fixed and embedded by permitting 40% formalin to dialyse through the parchment. The formalin permeates the emulsoid, forming a solid block in from 2–8 hours. Sections are then cut on the simple microtome designed by Terry which employs safety razor blades.
Full details of the method should be obtained from the original article. W. suggests that it will be of value to field workers who are not equipped with the usual laboratory apparatus and who require a quick diagnosis of biopsy specimens.—R. E. GLOVER.

GOULD, G. N., Jr., HIGNETT, S. L., & STEELE-BODGER, H. W. (1942). **Suggested Technique to be Employed in Pregnancy Diagnosis, and the Treatment of Infertility in the Bovine.**—*Vet. Rec.* **54.** 69–74.
This is a descriptive article suggesting a method for the investigation of sterility in cattle. The herd is first dealt with as a unit, a type questionnaire being given followed by details of the procedure to be adopted for the examination of male and female animals. A technique for the examination of the genital tract of the female is described in detail. Possible findings which result in sterility are enumerated, and modes of treatment are suggested for vaginitis and trichomoniasis. A method for the clinical diagnosis of pregnancy is fully described, and the authors emphasize that no treatment of any kind should be undertaken until a definite diagnosis of pregnancy or absence of pregnancy has been made. The techniques for intra-uterine injection and for expression of the corpus luteum are dealt with in some detail. The article closes with a short note on the hormone control of the oestrous cycle.—N. J. SCORGIE.

WOODLAND, V., TOWSON, C., & CLARKE, C. D. (1941). **Rubber Casts of Medical Subjects.**—*J. Lab. clin. Med.* **26.** 1981–1988.
Description of methods of preparing casts, rubber latex being used.

MISCELLANEOUS

LECLAINCHE, E. (1941). Die veterinäre Sanitätspolizei im neuen Europa. **[Veterinary Police in the German Conception of the "New Europe"].**—*Z. InfektKr. Haust.* **58.** 1–4.
L. states the need for reconstruction of war-depleted herds of cattle and for a development on a more intensive scale than heretofore of disease eradication and schemes for forming new clean herds.

The *Office International des Epizooties* at Paris was restored to activity in 1941 under German auspices in their " New Order ", and L. has been retained in the post of director.—J. E.

LECLAINCHE, E. (1942). Die veterinäre Sanitätspolizei im neuen Europa. **[Veterinary Police in the German Conception of the " New Europe "].**—*Berl. Münch. tierärztl. Wschr.* Jan. 9th. 1–2.

The author stresses the necessity and extreme urgency for the replenishing, rebuilding, and reorganizing of adequate stocks of cattle and other farm animals now, under the German " New Order ". Both infectious and non-infectious diseases are likely to find favourable ground for development in animals which have been moved about the continent in great numbers and have been badly cared for and insufficiently fed. In particular, the prevention of the large-scale spread of foot and mouth disease will necessitate international collaboration. In the control of tuberculosis, it is important that disease-free herds should be founded, and that infected animals should be removed from existing herds.

As mentioned in the preceding abst., the German authorities have reopened the *Office International des Epizooties*, retaining L. as director.—E. R. PARISER.

KOROL', A. G. (1939). Pravil'no organizovat' rabotu oblastnykh vetbaklaboratorii. **[Organization of Regional Veterinary Bacteriological Laboratories in the U.S.S.R.].**—*Sovyet. Vet.* No. 3. pp. 50–55.

After the revolution in Russia there was considerable increase of the veterinary services, reconstruction of animal husbandry, and the control of epizootics on broad bases. These developments led to the creation of a huge net of laboratories, the organization and structure of which has not always been uniform and expedient. Standard regulations are required. It is recommended that permanent staffs should be established in each section which should be under the supervision of senior specialists. For field work trained epizoologists and bodies of veterinary surgeons should be organized, which in case of emergency could be moved from one area to another. The present subdivision in sections for bacteriology, epizoology, serology, helminthology, and chemistry might be retained. A special research section should be organized.

More attention should be given to the study of the epizoological state of the region, and schemes for investigation and eradication of the most important diseases should be elaborated and put into practice. It is also necessary to standardize the technique for the collection and transportation of material for laboratory examinations and to supply the veterinary workers with special record forms, examples of which are given. The training of bacteriologists should be improved by regular post-graduate courses. Organization of permanent courses of not less than one year is also necessary for laboratory assistants. Regional meetings and consultations for bacteriologists and epizoologists are recommended. The bacteriological sections of many laboratories are in need of improvement by the provision of more highly skilled workers and better equipment.

—A. MOLDAWSKY.

HÖFLIGER, H. (1940). Die Entwicklung des tierärztlichen Studiums in der Schweiz. **[Development of Veterinary Education in Switzerland].**—*Schweiz. Arch. Tierheilk.* **82.** 367–386.

There were three phases in the development of veterinary education in Switzerland. The first stage was the period between the foundation of the two first veterinary schools in Berne (1805) and in Zürich (1820), and the " medical agreement " in 1867. This *Medizinal-konkordat* made it possible for veterinary surgeons to exercise their profession in other cantons than those in which they had passed their final examinations. The second stage was the substitution of the *Konkordat* by a Federal law of 1888 which brought all examinations of the medical faculty (including veterinary science) under the legislation of the Minister for the Interior. The matriculation standard for the veterinary course was thereby considerably raised, the full higher school certificate (*Matura*) being made compulsory in 1899; finally, veterinary science was raised to the status of a faculty. In the third stage great progress was made in all the branches of the faculty; biochemistry was introduced into the curriculum, the field of the course was broadened and the standard of teaching was improved. The duration of the veterinary course was extended to five years in 1935.—E. R. PARISER.

—. (1941). La Escuela Nacional de Medicina Veterinaria. XXV aniversario de su funcionamiento como institución independiente. **[25th Anniversary of the Foundation of the School of Veterinary Medicine, Mexico].** pp. 37. Mexico: Imprenta Universitaria. [4to].

Veterinary education began in Mexico with the founding, in 1853, of a combined college of agriculture and veterinary science. In 1916, however, the school of veterinary medicine was established as a separate institution.

The school has a staff of 32 and, from the photographs, appears to be well equipped. The veterinary course covers a period of five years, but students must first take a preparatory course lasting two years. This preparatory course includes biology and chemistry. No details are given of the number of students or of teaching methods.—MILLER WATSON.

TE HENNEPE, B. J. C. (1941). Das Niederländische Reichsseruminstitut in Rotterdam. **[The Rijks Serum Institute at Rotterdam].**—*Dtsch. tierärztl. Wschr.* **49.** 454–457.

A detailed description is given of the work of the Rijks Serum Institute at Rotterdam. It is divided into five parts:—(1) investigation of obscure diseases; (2) preparation of sera and vaccines; (3) control of biological products prepared by commercial firms; (4) laboratory diagnosis, and (5) preparation of rat control substances.

An account is given of the number of examinations and their nature as well as of the results which were achieved during 1939. The general trend of diseases of animals in the course of a year is shown and it is, for instance, pointed out that during 1941 considerably more sera and vaccines against foal and calf diseases were prepared than against pig diseases. During 1939, products were prepared for the treatment of 3,140,000 animals and 49,926 examinations were carried out.

—E. R. PARISER.

—. (1941). Inauguración oficial de la sede de la sección laboratorio de biología animal de la Dirección de Ganadería. **[Official Opening of the Institute of Animal Biology of the Livestock Department, Uruguay].**—*Bol. mens. Direcc. Ganad., Montevideo.* **25.** 2–25.

An account of the opening ceremony of the institute with a report on speeches delivered. There is no description of the laboratory or of its work, but photographs show that it is of large size.

SMITH, J. (1941). **Biennial Reviews of the Progress of Dairy Science. Section F. Milk-Borne Diseases.**—*J. Dairy Res.* **12.** 227–240.

The ground covered by this review of the literature of

1938–40 inclusive extends to a general introduction and to sections on epidemiology, streptococcal infections, staphylococcal food poisoning, TB., salmonella infections (enteric fevers and food poisoning), dysentery, brucella infections, virus infections, and miscellaneous.
—J. E.

—. (1941). **[Report of Committee on] Biological Products.**—*J. Amer. vet. med. Ass.* **99.** 438–439.
Fifteen biological products are named for inclusion in the list of such products whose value has been considered well established. Their acceptance applies only to products manufactured under Unites States veterinary licence and under inspection of the Division of Virus Serum Control of the United States Bureau of Animal Industry. The total number of products listed by the Association is now 39.

A recent order of the Bureau of Animal Industry prohibits the inter-state transit of any product consisting of live virus or live organisms without a notice being sent in a prescribed form to the Bureau and to the live-stock sanitary official in the state to which the product is consigned. It is thought by the Committee that this order will be of great assistance in controlling the inter-state traffic in biological products which is carried on in violation of regulations in states where there are restrictions on the use of certain of these products.
—H. V. HUGHES.

OFFICIAL AND OTHER REPORTS

GREAT BRITAIN. (1941). **Animal Diseases Research Association, Moredun Institute, Gilmerton, Midlothian. Annual Report and Accounts for 1940-1941. Report of the Director of the Institute for 1940-41.** pp. 19. Gilmerton, Midlothian : Moredun Institute. [8vo].

ADMINISTRATION.—The research staff numbered eight. Details are given of the financial arrangements : the total expenditure was £12,733, while receipts from the sale of biological products against LAMB DYSENTERY, BRAXY, and LOUPING ILL amounted to £3,000.

RESEARCH.—An investigation was begun into the problem of erroneous results in the tuberculin test on cattle. An attempt was made to prevent " PULPY KIDNEY " DISEASE in lambs by the vaccination of ewes ; the work is being continued. It was observed that " WHITE SCOUR " in calves was associated with vitamin A deficiency of the colostrum and that this deficiency could not be removed by vitamin A supplements given to cows. The aetiology of " GRASS SICKNESS " remained a problem ; a new approach based on a virus causation theory has been planned. An experimental flock was purchased for the study of SCRAPIE in sheep. Work on " cripples " in lambs in tick-infected flocks showed that staphylococcal infection was involved. " PINING " in certain areas was shown to be preventable and curable by cobalt. Study was made of the value of phenothiazine therapy for PARASITIC GASTRITIS of lambs.—J. E.

CANADA. (1938). **[Report of Work on] Pathology and Bacteriology [Ontario Research Foundation, 1937].** [HADWEN].—*Rep. Ont. Res. Fdn, 1937.* pp. 19–21.
The major portion of the time was devoted to work on BOVINE MASTITIS and SHEEP PARASITISM. MASTITIS was studied in 12 herds, the results of tests of milk samples being correlated with the clinical reports. The object was to eliminate infected animals and also to test under normal conditions simple measures designed to prevent the spread of the disease in a herd. In addition a clinical examination was made of 594 cows in 28 herds and the milk from individual quarters was tested every three months by bacteriological and microscopic examination and also by the bromthymol blue and rennet tests. 39% were positive for mastitis, 9·6% suspicious, and 51·4% free from evidence of infection. Of the positive cases 67·2% were due to streptococci, and 21·5% to staphylococci ; in three cases infection was due to *Corynebacterium pyogenes* and in 23 the cause was not determined.

Various strains of *Brucella abortus* obtained by dissociation from normal virulent types were studied in culture and in small animals. The encouraging results of earlier experiments prompted further work on the possibility of completely immunizing animals by injections of positive serum.

In the study of SHEEP PARASITISM thirty-eight lambs showed an average of 4,000 parasites in the intestina tract ; no blood changes, such as have been reported in parasitism elsewhere, were found as a result of this degree of infestation in lambs in Ontario. The life-history of the sheep nose-fly *Oestrus ovis* was studied, and also parasites of game, especially deer, and of fish. *Syngamus trachea* was found in three pheasants.
—J. A. GRIFFITHS.

BRITISH GUIANA. (1940). **Report on Livestock and Veterinary Division for Year Ending 1940.** [FRASER, H. A.] pp. 14. [fcp] [Mimeographed].
Drought conditions caused severe losses of livestock from shortage of water and fodder and the increase in the numbers of ticks.

There were no outbreaks of notifiable diseases. Some tuberculin testing is done. Two reacting cows in a herd of 25 are recorded and other herds tested are said to have had a lower percentage of reactors. A few of the beef cattle intended for export to Trinidad were condemned for TUBERCULOSIS.

ANAPLASMOSIS and PIROPLASMOSIS caused deaths on three pastures in Demerara. Starvation and heavy tick infestation were the important factors on two of the pastures ; on the third the cattle were grade Holsteins and eight of these recovered after receiving sodium cacodylate treatment. A tour of the hinterland savannahs, Rupununi District, was made by the government veterinary surgeon. Heavy HELMINTH INFESTATION was found in three young horses examined P.M. Some evidence of calcium deficiency was noted among equines. The local cattle are said to be " long legged and shallow bodied although in fair condition ". Better bulls are required to improve the type of animal. 25% of the slaughter cattle come from this area.—J. A. GRIFFITHS.

FRENCH EQUATORIAL AFRICA. (1940). Rapport sur le fonctionnement technique de l'Institut Pasteur de Brazzaville en 1940. **[Report of the Pasteur Institute, Brazzaville, for 1940].** pp. 89. [Items of veterinary interest pp. 83–89]. Brazzaville : Imprimerie officielle. [8vo].
The institute has a veterinary section charged with diagnostic work and with the production of biological products ; this section is also in charge of the livestock of the institute. Owing to the departure of the veterinary officer on war service, the work of the section in 1940 was greatly restricted. A small amount of diagnostic work is reported in some tables. An outbreak of FOWL POX at the station is described ; an attempt to produce a vaccine failed.

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